SECTION 3. ASSESSMENTS OF WATERBODIES AND WATERSHEDS, 5TH ORDER HUC

3.1 §303(d) Listed Streams Proposed for De-listing, with Sediment as the Listed Pollutant of Concern: Includes Streams De-listed in the DEQ 1998 §303(d) List

A. Trapper Creek

Summary
Trapper Creek was added to the 1994 §303(d) list, and retained on the 1996 list, as a result of a Stream Segment of Concern (SSOC) designation in 1990 under Idaho's Antidegradation Agreement with EPA. Listed pollutants are sediment and habitat alteration. In 1990 a SSOC Local Working Committee (LWC) was established. The LWC findings were: "that the beneficial uses cold water biota (i.e. trout rearing) and salmonid spawning particularly in regard to the adfluvial westslope cutthroat trout, were not fully supported, and that road construction/maintenance problems, wildfire, and logging were all factors contributing to the stream's condition" (IDL 1991). The LWC established Site Specific Best Management Practices (SSBMPs), and these were adopted and have been applied by IDL.

Based on BURP data collected in 1994 at two assessment sites, fish population data collected by the IDFG from 1991 - 1998, stream habitat data collected through SSOC monitoring in 1991, and IDL - CWE surveys conducted in 1995, Trapper Creek was found to fully support all of its designated and existing beneficial uses. Trapper Creek was de-listed from DEQ's 1998 §303(d) List with sediment as the listed pollutant of concern (IDEQ 1999). This SBA supports the de-listing.

3.1.A.1 Physical and Biological Characteristics

Trapper Creek is a 4th order tributary to Upper Priest Lake (Figure 2-2), with a watershed size of 12,292 acres and a main stem length of 7.9 miles (Table 2-2). There are approximately 29 miles of perennial streams in the watershed. Trapper Creek originates in the Selkirk Mountain crest and flows southwest to the upper lake. Tributaries to the main stem flow east to west. Elevation of the watershed ranges from 2,438 ft at the lake to 6,600 ft at Phoebe Tip. Average annual precipitation increases from 32 inches at the mouth to 50 - 60 inches at high elevations. Precipitation is mostly snow with a snowmelt dominated runoff pattern. Based on hydrographs for WY 1994 and 1995 established on Lion Creek and Two Mouth Creek (east side streams south of Trapper, see Two Mouth Creek hydrograph, Figure 3-4), high flow occurs between late April to mid-June (Rothrock and Mosier 1997). Peak flow in late spring is associated with daytime air temperatures greater than 80°F. Late winter rain-on-snow runoff events occasionally occur, but for Trapper Creek with its northern latitude, the effect on the daily flow pattern would likely be minimal.

Higher elevations of the watershed are glacially scoured resulting in thin or absent soils and relatively thin and isolated glacial drift patches (IDL 1997a). Bedrock type is granitic batholith (Figure 2-4). Most rock outcrop is hard, durable, and slightly weathered material. The general soil map of the basin describes high elevation soils as residual origin, Prouty-Jeru (Figure 2-5, Table 2-3). The main stem course, as well as most tributary stream courses, is within a glaciated valley with till deposited by receding glaciers (IDL 1997a). Glacial till general soil type is Priestlake-Treble. Soils in the watershed are considered to have a high inherent hazard for surface erosion (IDL 1997a).

Conifers in lower to mid-elevations include western hemlock, western red cedar, western white pine, Douglas-fir, grand fir, and western larch. Higher elevations support primarily Englemann spruce and subalpine fir, interspersed with numerous rock outcrops, scree slopes, and brushy areas. In 1967 the Trapper Peak Fire removed about 2,000 acres of conifer canopy in the headwaters (Figure 3-1c).

Figure 3-1a. Trapper Creek Watershed: streams, gradients, and sampling sites.

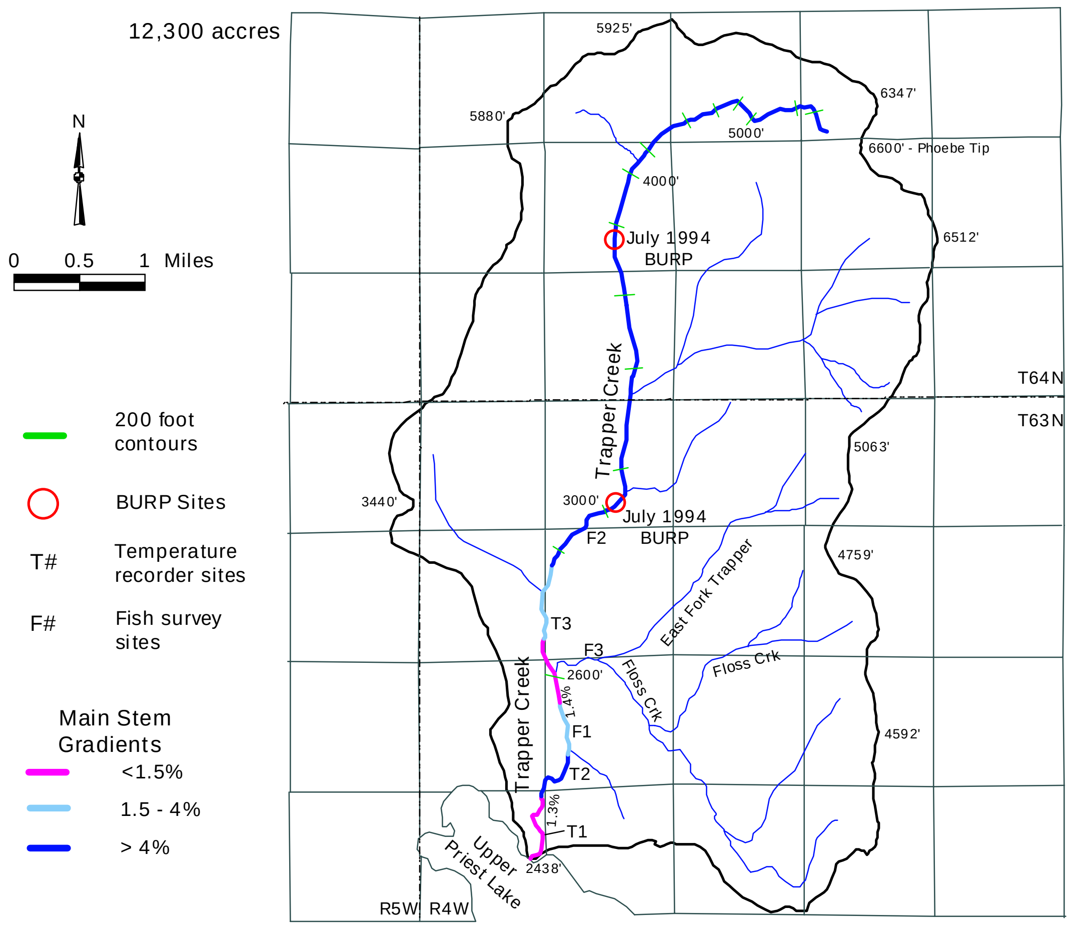


Figure 3-1b. Roads in the Trapper Creek Watershed.

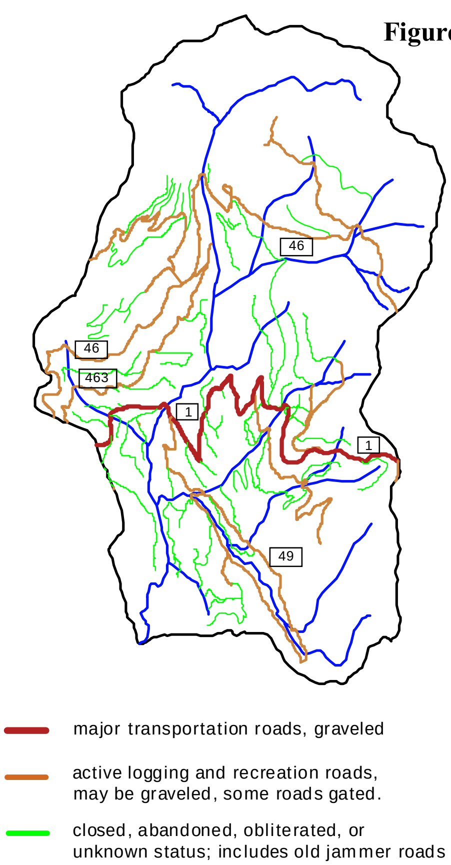
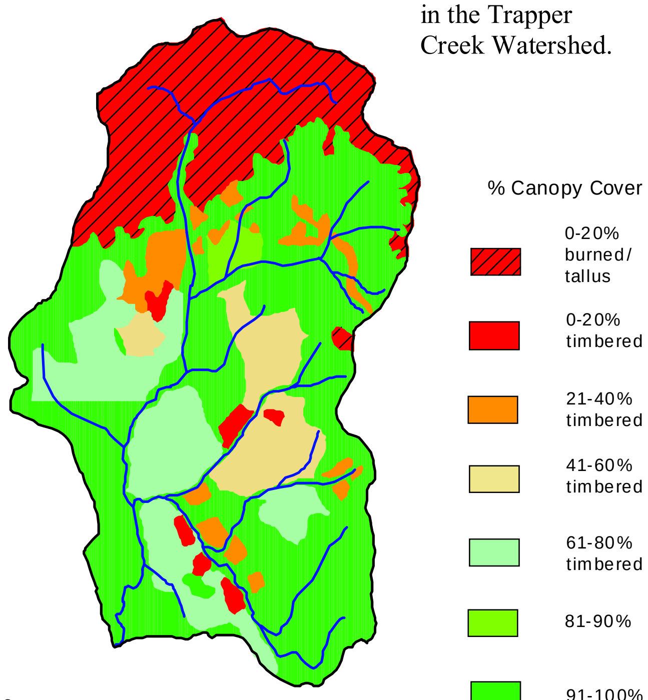


Figure 3-1c. Conifer canopy cover in the Trapper Creek Watershed.



Over 80% of the Trapper Creek main stem is moderate to steep gradient (1.5 - 13%) Rosgen B and A channel type (Figure 3-1a). Some stream segments are bedrock gorges with falls and cascading rapids. There are some stretches of gradual slope (<1.5%) in the lower one-third of the main stem. Several low gradient segments serve as fine sediment depositional zones, including ponds behind beaver dams. There are C channel segments with fairly wide riparian zones, standing water, and vigorous alder growth with a sparse conifer overstory. There are plentiful beds of gravel and cobble suitable for salmonid spawning.

Trapper Creek is a key bull trout watershed. Adfluvial bull trout of Upper Priest Lake spawn in Trapper Creek, and juveniles rear there for 2-3 years before migrating to the lake. The bull trout population is considered a small and "at risk" population (IDFG 2001). There is a barrier waterfall about 2.5 miles from the mouth and bull trout are not found above the barrier (Horner 1999). Brook trout are present but low in numbers. However, probable brook trout/bull trout hybrids have been sampled (Fredericks 1999). There are good densities of cutthroat trout in Trapper Creek, both below and above the waterfall barrier. It is believed that the majority of the cutthroat population is resident.

3.1.A.2 Cultural Characteristics

Trapper Creek watershed is remote, with land use primarily timber harvesting with some recreation use that includes snowmobiling. The majority of watershed acreage is owned and managed as timberland by the State of Idaho (Table 2-5). About 270 acres surrounding the mouth is federal land and managed as part of the Upper Priest Lake Scenic Special Management Area (withdrawn from the timber base).

As reported in 1995, timber had been harvested on 3,880 acres within the 30 previous years (Figure 3-1c). There has been slow vegetative and hydrologic recovery within the 2,000 acres of the 1967 fire due to high elevation and shallow soils (IDL 1997a). Unpaved road density is moderate.

3.1.A.3 Pollutant Source Inventory

Point Source Discharges
No point source discharges exist in the Trapper Creek watershed.

Nonpoint Sediment Sources

Mass Wasting - The 1995 IDL - CWE assessment rated mass failure sediment delivery as "low" (IDL 1997a). Only two instances of mass wasting were observed in the field observations, and both were associated with fillslope failures. Remediation measures have been implemented. No mass wasting was observed in timber harvest units or in undisturbed forested slopes.

Skid Trails - Historic timber harvesting used ground-based tractor skidding, some of this activity occurring in what is now defined as a FPA Stream Protection Zone (SPZ). CWE observations reported recovery of these old skid trails in the Trapper Creek watershed (IDL 1997a). New skid trails are outside the SPZ with vegetation and surface drainage BMPs to control erosion.

Roads and Stream Crossings - The 1995 CWE inventory of roads reported the following statistics: 18.3 miles of open road, 38.1 miles closed road with culverts removed (obliterated), 8 miles of closed road with culverts maintained, and 14.4 miles gated road, for a total of 79 miles of road. Total road density (minus obliterated roads) is 2.1 mi/mi^2, and active road density (including closed and gated) is 1.7 mi/mi^2. There are around 20 crossings of active roads across perennial streams, and an unknown number of crossings from closed and obliterated roads. The CWE field assessments were developed from evaluation of most open roads and some of the closed roads. Most roads near streams or in high risk areas were inspected.

The overall sediment delivery rating of roads was "low", reflecting minor road surface and inside ditch erosion but little delivery to stream channels (IDL 1997a).

Encroaching and Riparian Roads **-** There are very few road segments within 50 feet of perennial streams, but there are a few miles of road within 300 feet. The primary stretch of riparian road is along both sides of the C channel section of Floss Creek (State Road 49, Figure 3-1b), with a total road distance of about 4 miles. Density of riparian roads within the watershed is estimated at 2.6 mi/mi^2 riparian area (Panhandle Bull Trout TAT 1998a), below the basin average.

Timber Harvesting and Peak Flows **-** The calculated CWE canopy removal index (CRI) for Trapper Creek was 0.29 (see Table 2-9, page 35). Combining the CRI with an average channel stability index of moderate produced a hydrologic risk rating of "low" (IDL 1997a). The channel stability index was low (favorable condition) for a lower stream reach, but only moderate for an upper reach primarily due to a low amount of woody debris. Results of Riffle Armor Stability Indices (see water quality data below) indicate good channel stability. It has been estimated that 55% of the watershed has been logged historically (Panhandle Bull Trout TAT 1998a).

3.1.A.4 Summary of Past and Present Pollution Control Efforts

See Section 2.4.1, page 59.

3.1.A.5 Water Quality Concerns & Status

Refer to Table A-1 for the history of DEQ §305(b) and §303(d) listings for Trapper Creek; Table 2-6 for designated and existing beneficial uses; and Table 2-12 for determined support status of designated and existing beneficial uses.

3.1.A.6 Summary and Analysis of Existing WQ Data

Based on hydrographs developed for Lion Creek and Two Mouth Creek, a peak flow for Trapper Creek in May 1995 (WY 1995 was near the 50 year precipitation mean) is estimated between 250 - 300 cfs (Rothrock and Mosier 1997). Late summer base flow is between 5 - 10 cfs. Water volume for WY 95 was estimated at 36,750 ac-ft, with a surface water yield of around 3 ac-ft/acre.

In the spring of 1994 and 1995, a total of 7 samples during peak flow were taken at the Trapper Creek mouth for water column parameters. One unique feature of all east side streams is the low amount of dissolved minerals coming from the granitic geology. Electrical conductivity ranged from 12 - 20 *u*mhos. Suspended sediment samples had a maximum value of only 2.1 mg/L TSS (1.4 NTU turbidity). A bedload of primarily large grained sand tends to roll along the bottom at high flows as opposed to staying suspended. All measurements of pH and DO were within cold water biota criteria. No samples for bacteria were taken.

The BURP MBIs for Trapper Creek were the highest recorded in the basin: 5.0 for the middle site and 5.1 for the upper site.

Fisheries data for westslope cutthroat trout and bull trout as sampled by IDFG since 1991 (surveys began in 1982) are presented in Table 3-1 with sampling site localities shown in Figure 3-1a. Brook trout are present but in very low densities.

Table 3-1. Results of IDFG Snorkeling and Electro-fishing in Trapper Creek

	Fish densities in fish/100 m²								
	1991	1992	1993	1994	1995	1996	1997	1998	Avg.
Cutthroat densities									
Above waterfall barrier ≈2.5 miles from mouth (F2 on map)	7.3	15.2	--	26.5	14.3	20.9	--	12.8	16.2
Below East Fork confluence (F1 on map))	4.3	3.8	1.3	4.5	3.2	4.8	2.9	6.4	3.9
East Fork Trapper (F3)	21.5	14.6	13.2	20.5	21.0	13.6	11.7	20.5	17.1
Bull trout below barrier									
densities	5.1	3.0	4.5	8.3	3.7	2.1	4.0	2.4	4.1
Total redds	--	--	4	4	2	5	3	2	3.3

Note: Bull trout redd counts in 1999 and 2000 showed 2 and 0 total redds respectively (Corsi *pers comm*).

Table 3-2. Selected Stream Habitat Parameters in SSOC Measurements, Trapper Creek, 1991

Parameter Measured	East Fork Trapper	Mid-Trapper	Upper-Trapper
Rosgen stream type	A3	B2	A3
Percent habitat area			
riffles	25%	36%	20%
glides	47%	36%	31%
pools	28%	28%	26%
shallows	0%	0%	23%
Habitat diversity index (100 is best)	50.0	50.0	86.8
Rearing quality (1:1 is good)	0.4:1	0.5:1	0.5:1
Cobble embeddedness	60%	75%	35%
Pool complexity (range is 0-10)	3.8	3.0	3.0
Residual pool index (filled=0, scoured=1)	0.43	0.33	0.66
Canopy cover	94%	66%	80%

There have been several surveys measuring fish habitat parameters related to the effects of stream sedimentation. In 1991 SSOC surveys (IDEQ 1994), three sites were measured: a middle site to represent a low gradient sediment depositional reach; an upper site to represent a low "impact" condition; and a site on the East Fork of Trapper Creek to represent a smaller 2nd order stream close to harvest and road building activity. Results of selected measured parameters are presented Table 3-2. Based on cobble embeddedness and residual pool index, the East Fork and mid-Trapper site had a higher degree of stream sedimentation, possibly linked to land use activity.

Results of the 1992 DEQ Use Attainability survey at one Trapper Creek site (Hartz 1993), include: overall habitat quality score was rated "good"; an above average (basin wide) pool frequency of 4.8 pools/100 m with a good pool complexity rating of 0.7 (1.0 maximum); but residual pool volume, at 104 m^3/km was well below the average for the wetted width stratified group of 3 - 5 m.

The BURP HI for the middle site was 108, one of the highest recorded in the basin. There were below mid-point scores for percent fines (29%), and a marginal slow/fast ratio of 0.5. At the upper BURP site HI = 96. Percent fines were low at 9%, but the slow/fast ratio was very poor at 0.13. For both BURP sites the wetted width/depth ratio was around 17, below the mid-point in BURP scoring, but a much more favorable ratio than the basin average of w/d = 27.

In 1998 IDL placed three HOBO® temperature sensors in Trapper Creek (Figure 3-1a), all within the lower one-third of the main stem. Hourly readings were tabulated from June 6 - October 5. Mean daily temperature from the middle site 2, as well as daily maximum temperatures, are plotted in Figure 3-2. For sites 1 - 3 mean July temperatures were 14.2, 13.8 and 13.3°C. Highest daily average was 16.8°C at site 1, and highest hourly temperature recorded was 18.9°C at site 1. The moving 7-day mean maximum daily temperature exceeded 10°C in early July (EPA bull trout criteria), and remained above that value until late September.

The CWE, stream canopy closure/temperature assessment, rated all main stem segments between each 200 foot contour as "low" (favorable, Table 2-9), except for the lowest three segments. In these lower segments the ranking was "high", or adverse temperature condition exists, with a 21 - 40% stream canopy cover. It is within this stream reach that the three temperature sensors were placed. The CWE report concluded that the lack of conifer canopy cover in these segments is a natural condition, with fairly wide riparian zones of saturated soils and vigorous alder growth preventing the regeneration of a conifer overstory (IDL 1997a).

3.1.A.7 Status of Beneficial Uses

There have been no documented exceedances of the pH and DO numeric criteria for cold water biota. The BURP MBI results along with the IDFG fish surveys indicate Full Support (FS) of cold water biota beneficial use. The fish sampling shows FS for salmonid spawning. Various stream habitat surveys do indicate less than optimum fish spawning and rearing conditions related to stream sedimentation. There are no bacteria data, so primary contact defers to cold water biota which shows FS.

Stream temperatures show that for at least the lower one-third of Trapper Creek, there are exceedances of both State Standards criteria for cutthroat trout spawning and incubation in July, and the EPA bull trout criteria from July - September.

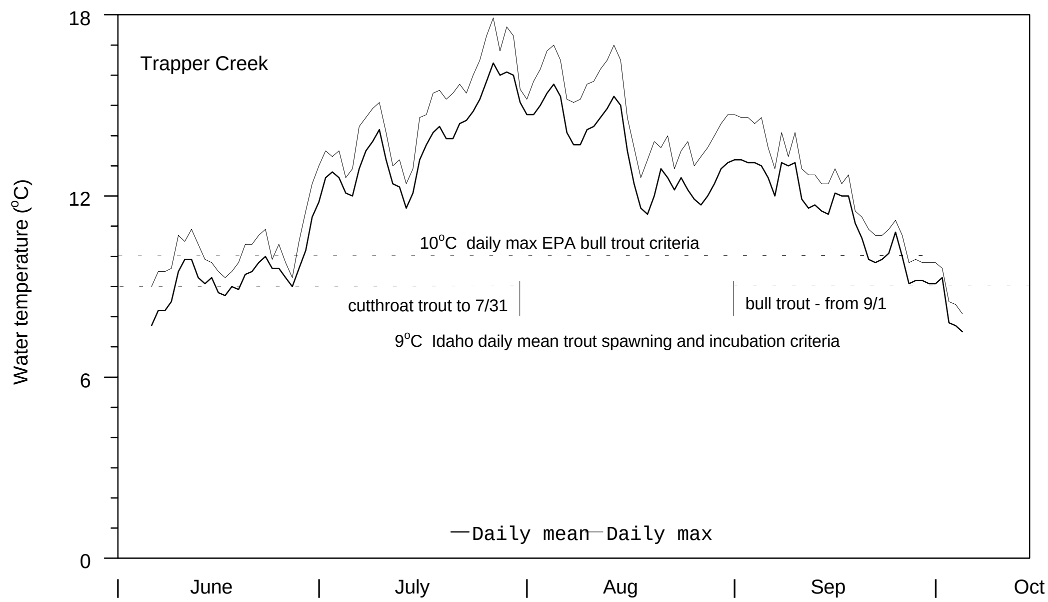


Figure 3-2. Mean daily and daily maximum water temperatures from June 6 - October 5, 1998 at Trapper Creek site 2.

3.1.A.8 Data Gaps

Depending on adoption of new temperature criteria in upcoming revisions of Idaho's Water Quality Standards, and where the new criteria limits are set, it would be useful to place temperature sensors in the middle and upper stretches of Trapper Creek where stream canopy cover is estimated at 91 - 100%. It would be anticipated that because of the significance of Trapper Creek as a key bull trout watershed, that fish sampling surveys, bull trout redd surveys, and habitat assessments would continue on a routine basis.

3.1 §303(d) Listed Streams Proposed for De-listing, with Sediment as the Listed Pollutant of Concern: Includes Streams De-listed in the DEQ 1998 §303(d) List

B. Two Mouth Creek

Summary
Two Mouth Creek was added to the 1994 §303(d) list and retained on the 1996 list, as a result of a Stream Segment of Concern (SSOC) designation in 1990 under Idaho's Antidegradation Agreement with EPA. Listed pollutants are sediment and habitat alteration. In 1990 a SSOC Local Working Committee (LWC) was established. The LWC findings were: "that the beneficial uses cold water biota (i.e. trout rearing) and salmonid spawning, particularly in regard to the adfluvial westslope cutthroat trout, were not fully supported, and that road construction/maintenance problems, wildfire, and logging were all factors contributing to the stream's condition" (IDL 1991). The LWC established Site Specific Best Management Practices (SSBMPs), and these were adopted and have been applied by IDL since 1991.

Two Mouth Creek was retained on the 1998 §303(d) List because DEQ retained all water bodies where water quality was determined by the EPA to be "threatened" in 1994 assessments (IDEQ 1999, see Table A-2). However, this SBA concludes that Two Mouth Creek fully supports all of its designated and existing beneficial uses based on: BURP data collected in 1994; fish population data collected by IDFG from 1991 - 1996, by BURP crews in 1994, and IDL in 1997; stream habitat data collected through SSOC monitoring in 1991 and 1994; and IDL - CWE surveys conducted in 1994. Two Mouth Creek is proposed for §303(d) de-listing with sediment as the listed pollutant of concern.

3.1.B.1 Physical and Biological Characteristics

Two Mouth Creek is a 3rd order tributary to Priest Lake (Figure 2-2), with a watershed size of 15,565 acres and a main stem length of 10.3 miles (Table 2-2). There are approximately 38 miles of perennial streams in the watershed. Two Mouth Creek originates in the Selkirk Mountain crest and flows west to the lake into Huckleberry Bay. Tributaries to the main stem flow north and south. Elevation of the watershed ranges from 2,438 ft at the lake to 7,292 ft at Harrison Peak. The watershed is characterized by steep, highly confined, bedrock, boulder, first order streams that quickly combine into the 3rd order main stem (IDL 1994).

Average annual precipitation increases from 32 inches at the mouth to 50 - 60 inches at high elevations. Precipitation is mostly snow with a snowmelt dominated runoff pattern. Based on hydrographs for WY 1994 and 1995, established by a stream gauge continuous recorder and numerous flow measurements (Rothrock and Mosier 1997), annual high flow occurs between late April to mid-June. The late spring peak flow is associated with daytime air temperatures greater than 80°F (Figure 3-4). Mid and late winter rain-on-snow events occur and can produce moderate rises in the hydrograph.

Higher elevations of the watershed are glacially scoured resulting in thin or absent soils and relatively thin and isolated glacial drift patches (IDL 1997b). Bedrock type is granitic batholith (Figure 2-4). Most rock outcrop is hard, durable, and slightly weathered material. The lower half of the stream course is within a glaciated valley with terraces of till deposited by receding glaciers (IDL 1997b). The area surrounding the mouth is glacial outwash and alluvium. The general soil map of the basin describes four soil groups in the basin (Figure 2-5, Table 2-3). In general, soils of the watershed are considered to have a high inherent hazard for surface erosion (IDL 1997b).

Conifers in lower to mid-elevations include western hemlock, western red cedar, western white pine, Douglas-fir, grand fir, and western larch (IDL 1997b). Higher elevations support primarily Englemann spruce and subalpine fir, interspersed with numerous rock outcrops, scree slopes, and brushy areas. There have not been extensive, stand replacing wildfires in the watershed over the last 100 years.

Only the initial one-half mile of Two Mouth Creek from the mouth is a gradual sloped channel (less than 1.5% gradient, Figure 3-3a). Going upstream, the next 4.5 miles is a mix of B and A channel ranging in gradient from 2.5-10%. The headwater stretch of 5.2 miles is all A channel, ranging from 5-20% gradient. A common reach type is a substrate of bedrock and boulders, including falls and cascading rapids. There are low gradient reaches that are sediment depositional zones, including ponds behind beaver dams. There are reaches of riffles and pool tailouts that have good quality gravel and cobbles for spawning. Broad floodplains are limited.

There are good densities of cutthroat trout, mainly resident populations. Brook trout are low to moderate in abundance. Bull trout are present but very low in numbers. There have been surveys for bull trout redds, but none have been found although spawning and rearing is suspected, and Two Mouth Creek is considered of high importance to bull trout recovery (Panhandle Basin Bull Trout TAT 1998a). In a 1956 survey, adfluvial cutthroat spawners were caught within the first five miles of Two Mouth Creek (Bjornn 1957). A barrier waterfall exists about 5 miles from the mouth.

3.1.B.2 Cultural Characteristics

Two Mouth Creek watershed is mostly State of Idaho Trust Land managed by IDL (91% of the watershed), but 820 acres of the eastern most mountain ridge is IPNF land, and 573 acres surrounding the mouth is privately owned (Figure 2-7 and Table 2-5). The private land is being developed by the Huckleberry Bay Company for single family homes/cabins, and this includes timber harvesting for lot development, construction of access roads, and operation of a sewage lagoon - land application system. A large block of 4,143 acres in the eastern high county is part of the Selkirk Crest Special Management Area, and withdrawn from the timber base (Figure 2-8). Besides timber management by IDL on state lands, there also are a few state lease cabins near the mouth of the stream. Recreation is popular in the watershed, with camping, hiking, hunting and snowmobiling.

Timber harvesting began in the watershed in the 1920s with flumes and skidways built as a means of moving logs down the stream to Priest Lake. Early logging primarily removed old growth white pine and cedar poles. During the late 1950s salvage logging was conducted to capture spruce bark beetle mortality, and this resulted in many low standard, poorly designed roads (IDL 1994). Logging on steeper slopes were jammer logged which required contour roads being constructed from 500 - 800 ft apart on slopes (IDL 1994).

As assessed in 1994 (IDL 1994), timber had been harvested on 4,611 acres within the 30 previous years (Figure 3-3c). The eastern half of the watershed as well as the southeastern mountain ridges have not recently been harvested or roaded. There is, however, a moderate degree of unpaved road density in the western half of the watershed (Figure 3-3b), with density of total roads calculating to 3.2 mi/mi^2 over the entire watershed, and about double that density if only the western half is considered.

3.1.B.3 Pollutant Source Inventory

Point Source Discharges

No point source discharges exist in the Two Mouth Creek watershed.

Nonpoint Sediment Sources

Mass Wasting - The 1994 IDL - CWE assessment rated mass failure sediment delivery as “low” (IDL 1997b). Only one moderate-sized roadfill mass failure was observed in field surveys, with some sediment delivery into a feeder stream.

Figure 3-3a. Two Mouth Creek Watershed: streams, gradients, and sampling sites.

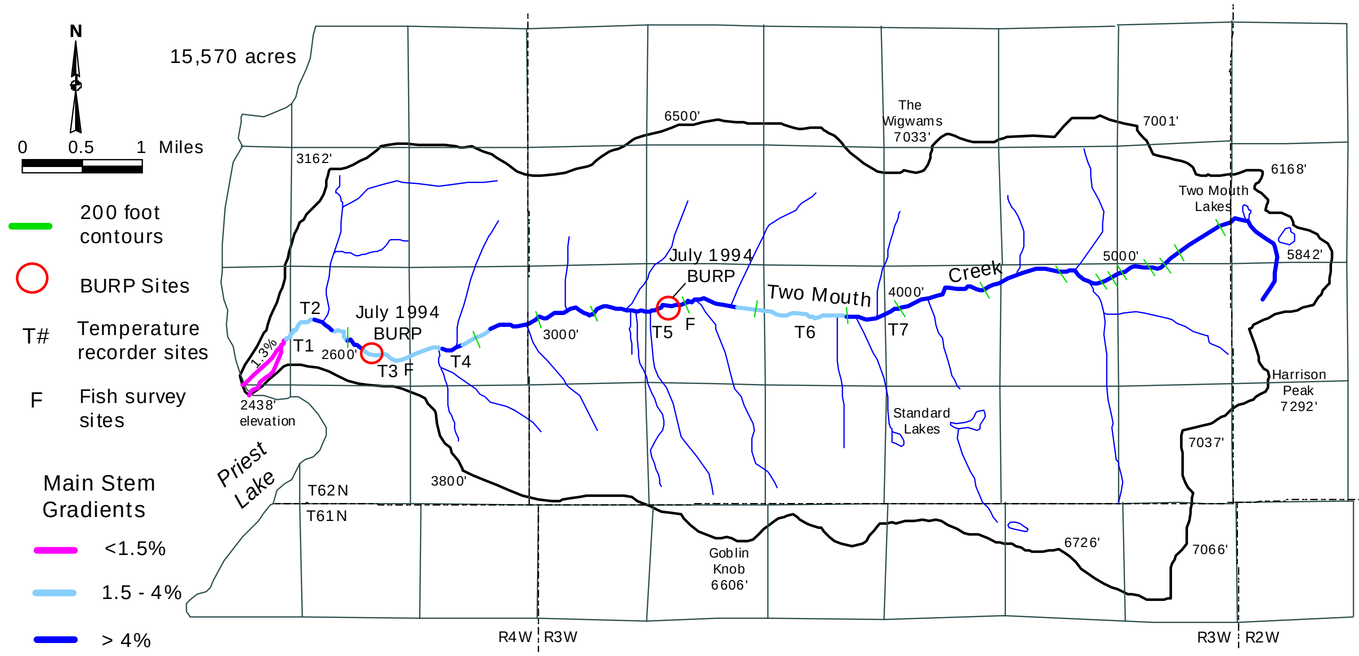


Figure 3-3b. Roads in the Two Mouth Creek Watershed.

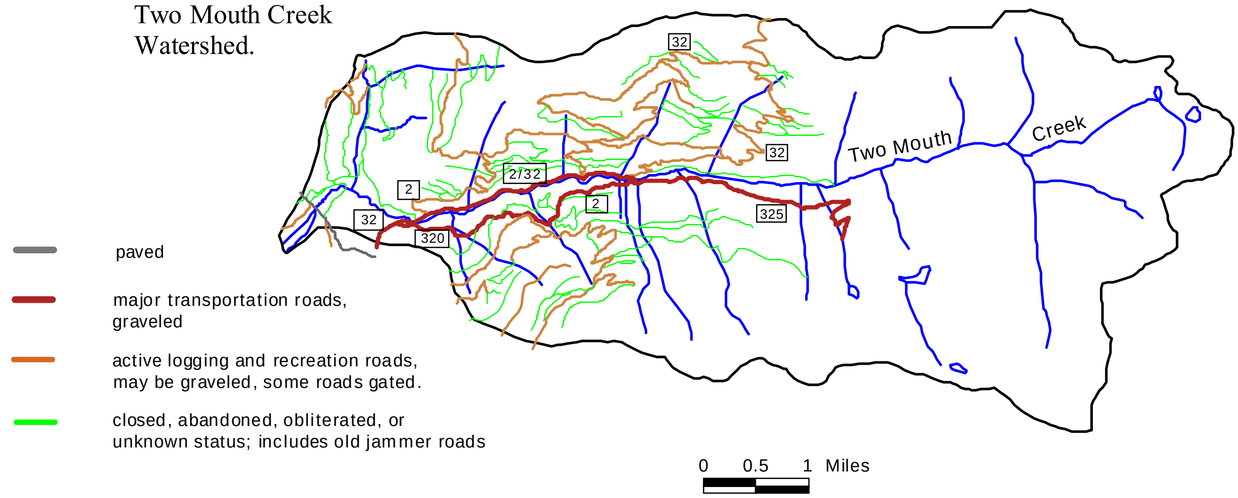
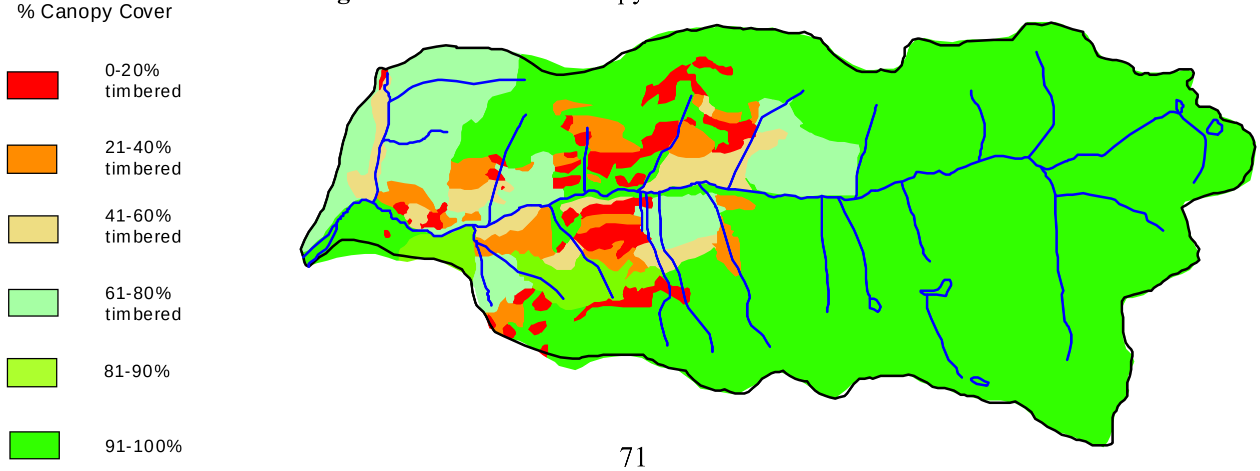


Figure 3-3c. Conifer canopy cover in the Two Mouth Creek Watershed.



Skid Trails **-** Historic timber harvesting used ground-based tractor skidding, some of this activity occurring in what is now defined as a FPA Stream Protection Zone (SPZ). CWE observations reported substantial recovery of these skid trails, and they will not be used in the future (IDL 1997b). New skid trails are outside the SPZ with vegetation and surface drainage BMPs to control erosion. The CWE assessment also reported that old jammer roads were brushed in and for the most part vegetatively recovered (IDL 1994).

Roads and Stream Crossings **-** The 1994 CWE inventory of roads reported the following statistics: 40 miles of open road, 18 miles of roads with other kinds of access controls, 12 miles of closed road with culverts removed, and approximately 20 miles of closed road with culverts still remaining, for a total of 78 miles of road (IDL 1997b). The CWE field assessments were developed from evaluation of most open roads and some of the closed roads. Most roads near streams or in high risk areas were inspected. The overall sediment delivery rating of roads was "low", reflecting minor road surface and inside ditch erosion but little delivery to stream channels.

Again, if only the roaded western portion of the watershed is considered in calculations (9,120 acres), total road density (active and closed with culverts remaining) is high at 5.5 mi/mi^2, and active road density (including roads with access controls) is 4.1 mi/mi^2. There are around 25 crossings of active roads across perennial streams, and an unknown number of crossings from closed and obliterated roads.

Encroaching and Riparian Roads **-** The major transportation road, State Road 2/32, travels 4.4 miles up Two Mouth Creek. About 3 miles of this road is within 300 ft of the main stem and as close as 50 ft in some reaches (Figure 3-3b). There would be some direct sediment delivery to the stream, and this road has likely impaired effective riparian function in some low gradient segments. One estimate of riparian road density in the watershed is quite high, 15.3 mi/mi^2 riparian area (Panhandle Bull Trout TAT 1998a).

Instream Erosion – A lower stream reach assessed during the 1994 CWE survey (about 1 mile from the mouth, C3 channel type), was found to have bank sloughing at a moderate frequency and size, with stream banks being eroded during annual bankfull conditions (IDL 1994). There was only moderate vegetative bank protection, and stream bank cutting was common. Based on other reaches surveyed, main stem segments with this degree of bank erosion is probably not extensive.

Timber Harvesting and Peak Flows **-** The calculated CWE canopy removal index (CRI) for Two Mouth Creek was 0.15 (Figure 3-3c, and see Table 2-9, page 35). IDL estimates that 2,800 acres of the watershed (18%) is in a natural opening condition (rock outcrops and talus slopes). Coupling the CRI with the channel stability index (CSI) produced a hydrologic risk rating of "low" (IDL 1997b). The CSI was moderate for a lower stream reach, and low (favorable condition) for an upper reach. The moderate CSI for the lower reach site (see *instream erosion* above) related to a low amount of woody debris, stream bank erosion and sloughing, and an altered streamside vegetative condition. The overall CSI is rated as moderate. Results of Riffle Armor Stability Indices (see water quality data below) indicate good channel stability. Historically, it has been estimated that 52% of the watershed has been logged (Panhandle Bull Trout TAT 1998a).

Urbanization - There are a few cabins and homes, access roads, and driveways in which stormwater runoff drains into the lower-most 0.6 miles of the stream (below East Shore road where the stream divides into two forks). Also, the sewage lagoon - land application system of Huckleberry Bay development resides within the lower-most watershed. There is routine sampling (four times yearly) for total coliform bacteria and nitrates of five monitoring wells within the land application area, as well as sampling of Two Mouth Creek down gradient of the land application area. Sampling is done by Intermountain Resources of Sandpoint, Idaho.

3.1.B.4 Summary of Past and Present Pollution Control Efforts

See Section 2.4.1, page 59.

3.1.A.5 Water Quality Concerns & Status

Refer to Table A-2 for the history of DEQ §305(b) and §303(d) listings for Two Mouth Creek; Table 2-6 for designated and existing beneficial uses; and Table 2-12 for determined support status of designated and existing beneficial uses.

3.1.A.6 Summary and Analysis of Existing WQ Data

The Two Mouth Creek hydrograph (Figure 3-4) shows that high flow in May 1995 was mostly between 300 - 350 cfs, but a one-day peak of 450 cfs was recorded (Rothrock and Mosier 1997). Late summer base flow is between 10 - 20 cfs. Water volume for WY 1995 was measured at 58,385 ac-ft, with a surface water yield of 3.7 ac-ft/acre.

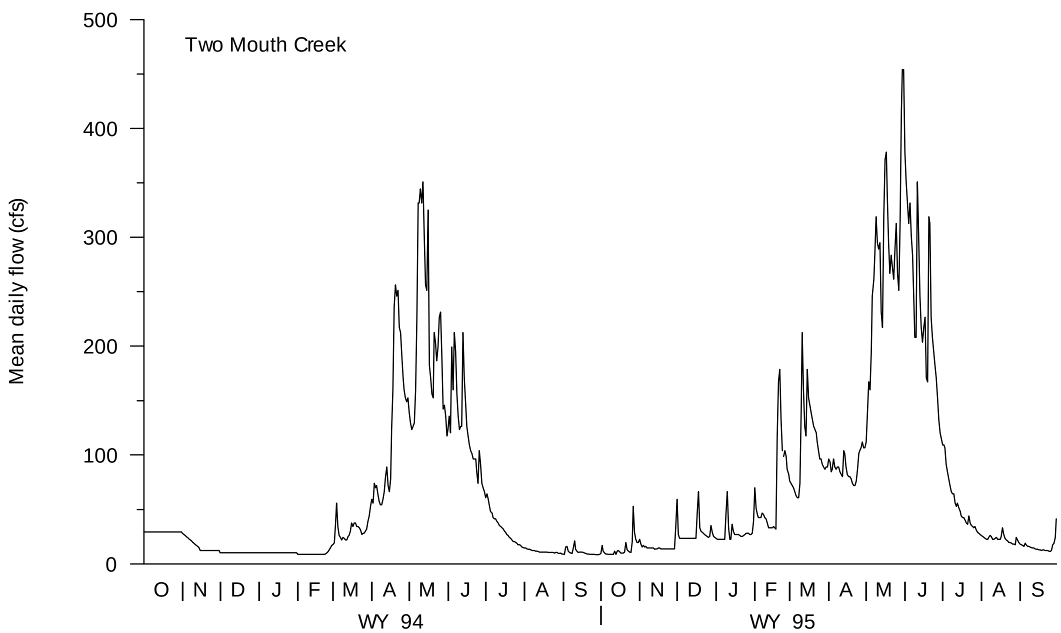


Figure 3-4. Mean daily flow rate for Two Mouth Creek, Water Years 1994 and 1995.

A total of 31 water quality sample runs were conducted between 1993 - 1995, in addition to 31 ISCO samples taken during spring runoff of 1994 and 1995. Dissolved minerals are low with ECs ranging from 10 - 20 *u*mhos. Suspended sediment concentrations were very low. The maximum sampled value was 15 mg/L TSS (7.2 NTU turbidity), and the mean TSS during spring runoff was 2 mg/L. Again, fine bedload is mostly large grained sand that does not readily suspend. Maximum total phosphorus was 50 *u*g/L, but mean TP during runoff was only 6 *u*g/L, about the same as base flow. Total nitrogen is extremely low, averaging between 60 - 100 *u*g/L.

Numerous instream measurements of pH and DO showed no numeric criteria exceedances. Samples for fecal coliform bacteria were not taken on Two Mouth Creek as part of the lake baseline study, but as mentioned earlier, total coliform samples are routinely taken as part of the conditional use permit for the

Huckleberry Bay sewage lagoon - land application system. The majority of results have been less than 50 TC/100 ml, and never above 500 TC/100 ml.

The BURP MBIs for Two Mouth Creek were 4.0 for the lower site, and 4.2 for the middle site (Figure 3-3a), both Full Support.

Fisheries data collected by IDFG, BURP crews, and IDL are presented in Table 3-3. Cutthroat trout densities range from low-moderate to high and show multiple age classes. Bull trout are present but low in numbers, and brook trout were low in abundance. In 1991 the IDFG conducted an additional snorkeling survey within 7 pools of Two Mouth Creek (IDEQ 1994). A total of 45 cutthroat trout and 8 bull trout were observed.

Table 3-3. IDFG and DEQ Snorkeling and Electro-fishing Results in Two Mouth Creek

	Densities in fish/100 m^2						
	IDFG Surveys by Snorkeling or Electro-fishing				BURP Electro-fishing		IDL Electro-fishing
	1987	1988	1989	1994	1994	1997	1997
Cutthroat trout	16.9	12.3	14.0	15.3	4.1	2.9	2.3
Bull trout	0.0	0.2	0.0	0.1	0.1	0.0	0.0
Brook trout	0.02	0.4	0.0	0.4	1.1	0.0	0.0
Sculpin	--	--	--	--	2.8	0.0	0.0

There have been several surveys measuring stream habitat parameters related to the effects of stream sedimentation. In 1991 SSOC surveys (IDEQ 1994), two reaches were measured: one mile above the mouth, and 4.5 miles above the mouth (about in the same vicinity as the BURP sites, Figure 3-3a). Both reaches are within the lower watershed timber harvesting zone. Results of selected measured parameters are presented in Table 3-4. The habitats were described as having a relatively low amount of deposited sand, good quality pools with complex habitat, and banks that were covered and stable (IDEQ 1994).

The 1992 DEQ Use Attainability survey (Hartz 1993) assessed 3 sites in Two Mouth Creek, all within the lower 2 miles of the stream. Results of the survey include:

- overall habitat quality score of “good” for sites 1 and 2, “fair” for site 3,
- pool complexity ratings of 0.7, 0.9, and 0.3 (1.0 maximum),
- pool frequency of 7.5 pools/100 m at site 1, but only 1.6 pools/100 m at sites 2 and 3, and
- residual pool volume of 292 m^3/km at site 1, above average for the wetted width group of 3-5 m, but 160 and 50 m^3/km at sites 2 and 3 which were below average for the wetted width group of 5-7 m.

Table 3-4. Selected Stream Habitat Parameters in SSOC Measurements, Two Mouth Creek, 1991

Parameter Measured	1 mile above mouth	4.5 miles above mouth
Rosgen stream type	B	B
Percent habitat area		
Riffles	47%	51%
Pools	53%	49%
Percent fines	17%	5%
Cobble embeddedness		
Riffles	30%	24%
Runs	33%	17%
Pools	45%	15%
Pool complexity (range is 0-10)	6.5	4.5
Canopy cover	53%	52%

The 1994 BURP survey recorded HI = 96 for the lower site and HI = 98 for the middle site, both above the basin average. Scores well below mid-point were similar for the two sites: a high degree inverse trapezoidal channel shape; a slow/fast ratio around 0.2; and a width/depth ratio of 24 at site 1, and a very poor ratio of 52 at site 2. Bank vegetation protection was also rated below mid-point. Percent fines were low, 16% at site 1 and only 7% at site 2.

In 1996 IDL placed seven HOBO® temperature sensors in Two Mouth Creek (Figure 3-3a for position), ranging from stream mile 0.5 to stream mile 6.2 (about two-thirds up the main stem). Hourly readings were tabulated from July 17 - September 30. Mean daily temperature at site 3, about 1.7 miles from the mouth, as well as daily maximum temperatures, are plotted in Figure 3-5. Note in Figure 3-5 the significant drops in stream temperature in late July and again in early August. All seven recorders showed this phenomenon, but the decreases would seem more than what could be attributed to changes in air temperature.

Averages for mean daily temperature from July 17 to August 31 were 12.3°C for sites 1 - 3, and then steady declines of 11.9, 11.2, 10.7, and 10.1°C for sites 4 - 7 respectively. Highest mean daily temperature was 14.7°C, and highest daily maximum was 16.7°C. The daily maximum temperatures remained above 10°C until mid-September (exceedance of EPA bull trout criteria).

The CWE, stream canopy closure/temperature assessment, rated the first five main stem segments (each 200 ft contour, from 2,400 ft to 3,400 ft elevation) as "high", i.e. existing canopy cover is less than the target canopy cover needed to maintain stream temperatures. This lower five segment stretch represents about 40% of the main stem length. Canopy cover was estimated at 21 - 40% for the first 3 segments, and 41 - 70% for the last two. SSOC and BURP surveys, all within this lower reach, measured the canopy cover (spherical densiometer) at consistently around 50%. Also, the first 5 temperature sensors were within this reach. In the upper half of the main stem the CWE canopy cover estimates ranged from 71 - 90% with a rating of "low" (favorable cover).

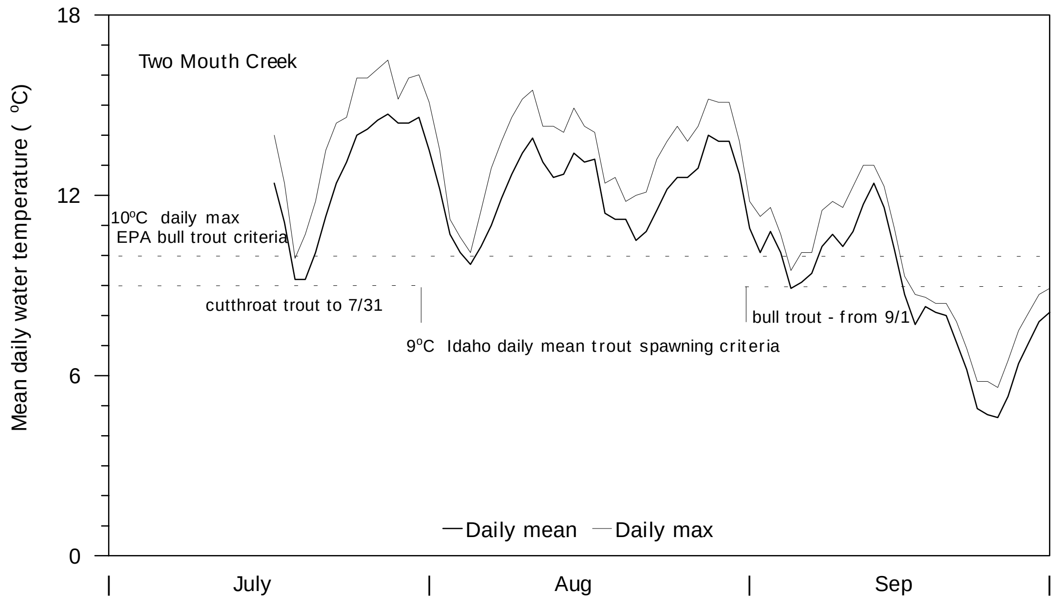


Figure 3-5. Mean daily and daily maximum water temperatures from July 17 - September 30, 1996 at Two Mouth Creek site 3.

The CWE report concludes that the below target stream canopy cover for the first 5 segments is, in part, a natural feature as the stream meanders through glacial outwash and alluvium, but also due to past harvesting that removed large cedar and hemlock adjacent to the stream prior to SPZ zones established by the FPA (IDL 1997b).

3.1.B.7 Status of Beneficial Uses

There have been no documented exceedances of the pH and DO numeric criteria for cold water biota. The BURP MBI results, and the IDFG and BURP fish surveys, indicate Full Support of cold water biota beneficial use. The fish sampling shows Full Support for salmonid spawning. Various stream habitat surveys indicate a range of less than optimum to good fish spawning and rearing conditions related to stream sedimentation. While percent fines appear low to moderate, and pool quality is adequate, there does appear to be a problem associated with channel widening and stream bank erosion. Bacteria data collected by Intermountain Resources shows that primary contact recreation is FS.

Stream temperatures show that for at least two-thirds of the Two Mouth Creek main stem, there are exceedances of both State Standards criteria for cutthroat trout spawning and incubation in July, and the EPA bull trout criteria from July - September.

3.1 §303(d) Listed Streams Proposed for De-listing, with Sediment and Nutrients as the Listed Pollutants of Concern: Includes Streams De-listed in the DEQ 1998 §303(d) List

C. Tango Creek

Summary
Tango Creek was added to the 1994 §303(d) list, and retained on the 1996 list, as a result of EPA analysis of the 1992 Idaho §305(b) report, Appendix D, in which DEQ evaluated cold water biota as supported/threatened and salmonid spawning as partial support. Listed pollutants are sediment and nutrients.

Based on BURP data collected in 1995 at one assessment site, fish population data collected by the USFS in 1996, and limited sampling as part of the 1993 - 1995 Priest Lake baseline study, Tango Creek was found to fully support all of its designated and exiting beneficial uses. In addition, land use activity has been moderate within the watershed and the associated road network is limited. Tango Creek was de-listed from DEQ's 1998 §303(d) List with sediment and nutrients as the listed pollutants of concern (IDEQ 1999), and this SBA supports the de-listing.

3.1.C.1 Physical and Biological Characteristics

Tango Creek is a small 1st order tributary on the west side of Priest Lake (Figure 2-2), flowing due east to the lake. Watershed size is 2,003 acres with a main stem length of 3.3 miles (Table 2-2). Tango Creek watershed is mostly forested and steep sloped, ranging in elevation from 2,438 ft at the lake to 5,400 ft just east of Blacktail Mountain. Average annual precipitation increases from 32 inches at the mouth to approximately 40 inches at high elevations. Precipitation is mostly snow with a snowmelt dominated runoff pattern. Based on numerous flow measurements at Beaver Creek, a nearby watershed to the north, high flow occurs between late March through May. Because of topography rising steeply to higher elevations, winter rain-on-snow runoff events would likely produce only minor spikes in the daily flow pattern, although, USFS rates the watershed as 85% sensitive snowpack (USFS 2000a).

Higher elevation lands surrounding the watershed are granitic batholith, while the valley hillslopes and stream cuts are glacial till and outwash (Figure 3-6b). The general soil map of the basin describes a Jeru glacial till soil that is stony-gravelly sandy loam, and a Hun residual soil that is gravelly silt-sandy loam (Figure 2-5 and Table 2-3). Both soils are rated as high for surface erosion hazard.

Conifers in moist cool slopes are mostly grand fir, hemlock and red cedar; while Douglas-fir, western larch, white pine, and lodgepole pine occupy semi-dry/dry soils. Around 1890 a fire ringed the ridge tops of the watershed (Figure 2-6), but there have been no large scale fires since then. Almost the entire length of Tango Creek is moderate to steep gradient (6 - 16%) Rosgen A channel type (Figure 3-6a). There are no stretches of wide flood plains. Brook trout and cutthroat trout have been collected in recent electro-fishing efforts. Tango Creek is considered low priority in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

3.1.C.2 Cultural Characteristics

The entire Tango Creek watershed is National Forest land. Fifty acres surrounding the mouth is part of the Priest Lake Recreation SMA, and 230 acres in the north are part of the Bottle Lake and Tepee Creek Research Natural Area (Figure 3-6c). The remaining acreage is managed for timber production. There was only limited early century logging in the watershed, and harvesting in the past 25 years has occurred on approximately 230 acres, primarily within the lower southern portion of the watershed (Figure 3-6e, USFS 1998b). USFS estimates that historically, 11% of the watershed has been logged (USFS 2000a).

3.1.C.3 Pollutant Source Inventory

Point Source Discharges
No point source discharges exist in the Tango Creek watershed.

Nonpoint Sediment Sources

Mass Wasting **-** USFS rates the watershed as low to medium for mass failure hazard (USFS 1998b). There have been no reported mass failures in the watershed.

Roads and Stream Crossings **-** GIS analysis of total unpaved roads in the watershed show a total of 12.7 miles, for a moderate road density of 4.1 mi/mi^2 (Figure 3-6d). More than half of this road network is closed, abandoned and/or obliterated, and the active road network of 5 miles produces a density of 1.6 mi/mi^2. The closed network of roads on hillslopes north of Tango Creek (Figure 3-6d), has been proposed for obliteration under the Douglas-fir beetle project (USFS 1999). There are around 5 road crossings across Tango Creek. Forest Road 638 is a primary road going up the stream, and is widely used for recreation including hunting and huckleberry picking. The first 1.2 miles of this road is within 50 - 300 feet of the stream. The road does not intrude on a floodplain, it is cut into a hillslope above the stream. This road segment could produce and deliver sediment into the stream. This 1.2 mile section is proposed for reconstruction under the Douglas-fir beetle project (USFS 1999).

3.1.C.4 Summary of Past and Present Pollution Control Efforts

See Section 2.4.2, page 60.

3.1.C.5 Water Quality Concerns & Status

Refer to Table A-3 for the history of DEQ §305(b) and §303(d) listings for Tango Creek; Table 2-6 for designated and existing beneficial uses; and Table 2-12 for determined support status of designated and existing beneficial uses.

3.1.C.6 Summary and Analysis of Existing WQ Data

Based on frequent flow measurements taken at Beaver Creek from 1993 - 1995, and two flow measurements taken on Tango Creek during spring high flow, peak flow for Tango Creek is estimated between 25 - 30 cfs (Rothrock and Mosier 1997). Late summer base flow is around 1 - 2 cfs.

Three water quality samples, all at peak flow, were taken at the mouth of Tango Creek in 1994 and 1995. Total phosphorus was low, ranging from <2 - 11 *u*g/L, and total nitrogen was extremely low ranging from 25 - 37 *u*g/L. These values are below TP and TN ranges from Beaver Creek with a sample size of n=15. Visual inspection of the stream bed within lower reaches of Tango Creek show no signs that the Standards Narrative criteria for excess nutrients is being exceeded.

Suspended sediment at Tango Creek had a maximum value of only 3.3 mg/L (1.7 NTU turbidity). There are insufficient measurements of pH, DO, and temperature to judge cold water biota numeric criteria. No samples for bacteria have been taken.

The BURP MBI for Tango Creek was 4.5. In 1996, USFS electro-fished Tango Creek near the mouth. Cutthroat trout were captured at a density of 2.9 fish/100 m^2, with two age classes including juveniles. Only three brook trout were sampled, 0.9 fish/100 m^2, with two age classes. No other species were reported. IDFG conducted a fish survey in 1987, and 38 cutthroat trout were captured (Horner *et at.* 1988).

Figure 3-6a. Tango Creek Watershed: streams, gradients, and sampling sites.

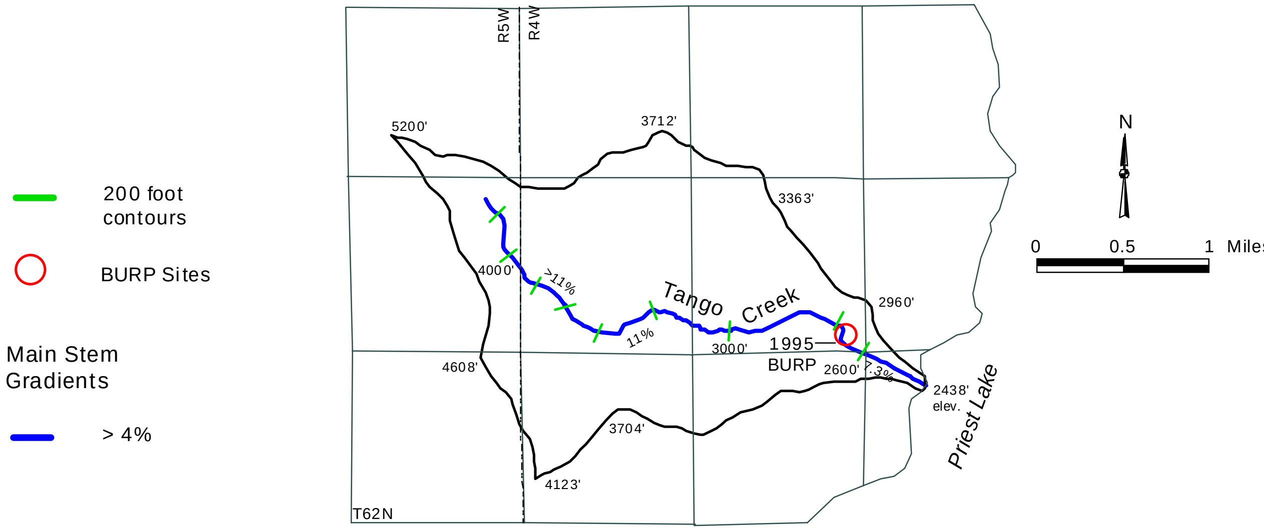


Figure 3-6b. Geology of the Tango Creek watershed.

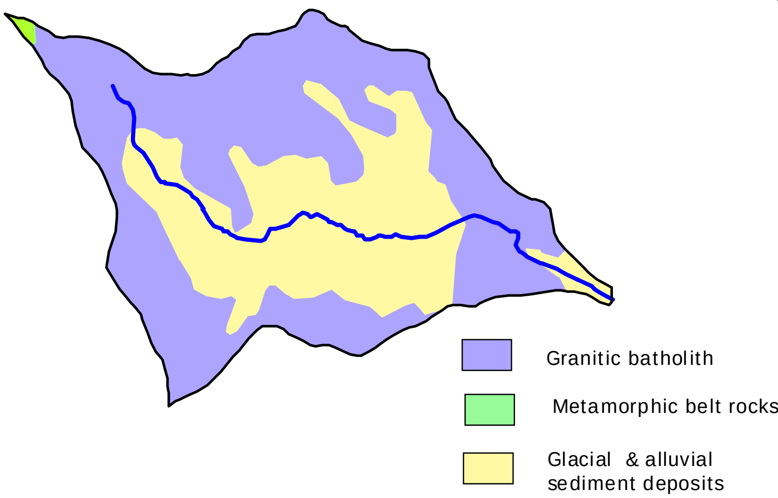


Figure 3-6c. General land use in the Tango Creek watershed.

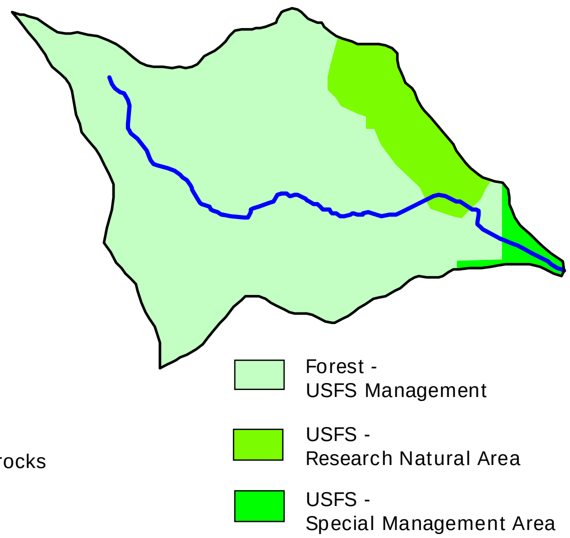


Figure 3-6d. Roads of the Tango Creek watershed.

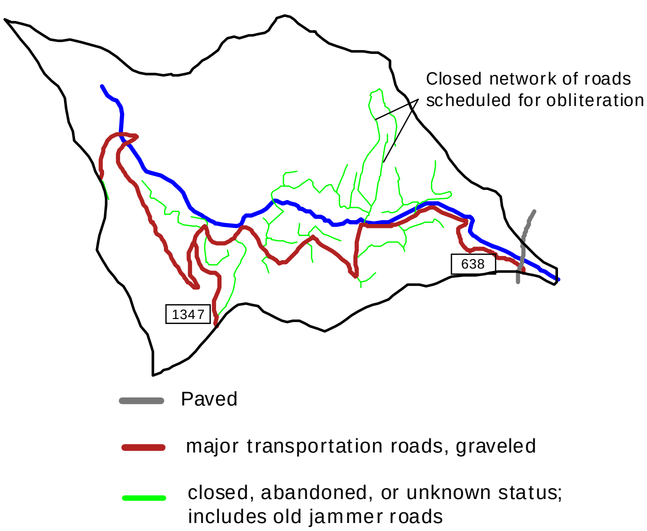
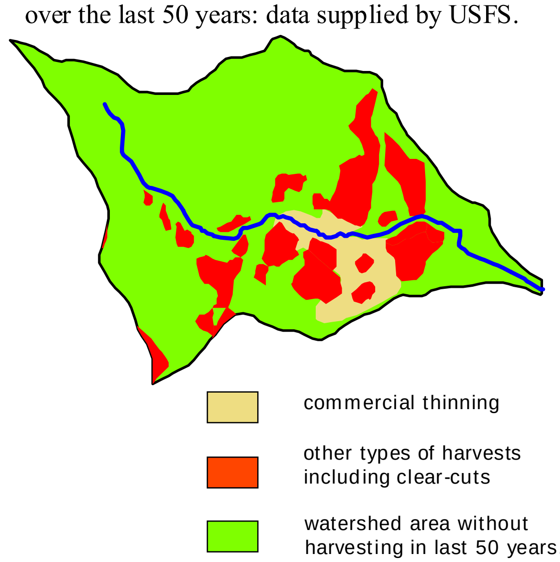


Figure 3-6e. Timber harvests in the Tango Creek Watershed over the last 50 years: data supplied by USFS.



The BURP HI score of 117 was the highest recorded in the basin. The BURP stream reach was in a deep V-shaped valley, good canopy cover of red cedar and grand fir, and stable channel bottom with boulders. Scores below mid-point were 31% fines, a slow/fast ratio of 0.1, and 50% bank vegetation cover.

3.1.C.7 Status of Beneficial Uses

The BURP MBI result is Full Support of cold water biota beneficial use. USFS and IDFG fish surveys, in conjunction with the BURP HI score, result in Full Support for salmonid spawning. The BURP stream habitat survey does indicate less than optimum fish spawning and rearing conditions related to percent fines and pool frequency. Samples for total phosphorus are well below the EPA established 50 *u*g/L instream criteria (EPA 1986), and numerous samples taken in nearby Beaver Creek never exceeded 15 *u*g/L TP. Nutrients are not a pollutant of concern for Tango Creek. There are no bacteria data, so secondary contact recreation defers to cold water biota which shows FS.

3.1.C.8 Data Gaps

Further electro-fishing and stream habitat surveys would be beneficial in further assessing beneficial uses in Tango Creek.

3.1 §303(d) Listed Streams Proposed for De-listing, with Sediment as the Listed Pollutant of Concern: Includes Streams De-listed in the DEQ 1998 §303(d) List

D. Lamb Creek

Summary

Lamb Creek was added to the 1994 §303(d) list, and retained on the 1996 list as a result of EPA analysis of the 1992 §305(b) report, Appendix D, in which IDFG and DEQ evaluated cold water biota as partial support and salmonid spawning as not supported. The listed pollutant is sediment.

Lamb Creek was de-listed in the 1998 §303(d) List (DEQ 1999) based on 1995 BURP data in which MBIs for a lower and upper site were Full Support for cold water biota beneficial use. BURP was repeated in 1997 at nearby lower and upper sites (data analyzed after the 1998 List), and MBI=3.4 at both sites resulted in a Needs Verification status call after following the Determination Flow Chart (Figure 2-10).

At the time of the 1998 §303(d) List, there had only been a single fish sampling within Lamb Creek (by USFS in 1995). In 2000, DEQ conducted electro-fishing at a lower and upper BURP site, and while no cutthroat trout were captured, there was good density of brook trout at both sites, and abundant sculpins at the lower site. Historically, Lamb Creek would have been inhabited by native cutthroat trout and bull trout, but the only fish survey for historic comparison was in 1956, where Lamb Creek was characterized as brook trout dominated with no mention of cutthroat trout observed or captured (Bjornn 1957).

Because both USFS and DEQ electro-fishing show a thriving brook trout population with FS for salmonid spawning, Full Support of cold water biota beneficial use is indicated. This SBA supports the §303(d) de-listing of Lamb Creek with sediment as the listed pollutant of concern.

Stream habitat data from BURP, DEQ Use Attainability, and a USFS R1/R4 survey together show poor to medium habitat values, although three out of four BURP Habitat Indexes were above the basin average (HIs = 97-99). USFS rates the Lamb Creek watershed system as hydrologically destabilized, with 30% Not Properly Functioning condition and 70% Functioning at Risk condition (USFS 1999). This condition in part relates to a stream bedload of sand that exceeds the stream's capacity to transport it.

As common with several of the mid to lower western watersheds, the Lamb Creek drainage has legacy issues with large fire events between 1890 - 1939, intermixed with salvage logging. There is also a natural geologic condition of granitic batholith. In addition, a large wetland - wet meadow floodplain of lower Lamb Creek has had modifications for development of hay cropping and grazing, including cross ditches to facilitate drainage. The historic wetland - wet meadow complex surrounding the lower-most stream reach has also been modified for rural residential/commercial development. These modifications have lessened the wetlands historic function of decreasing stream energy by affording a wide floodplain, and to allow a stream meandering pattern.

Sediment load calculations for the Lamb Creek watershed presented in Section 4 and summarized in this section suggest that the current sediment load represents a moderate increase over background, and possibly could inhibit any future fisheries management effort to restore cutthroat trout within the stream system. The road network has a relative high density, there are some ongoing agriculture impacts, there is hydrologic instability leading to stream bank erosion, and there is ever increasing urbanization impacts at the lower end of the drainage. There are opportunities for reduction of watershed sediment delivery and riparian improvement, from both public and private lands, which may aid in the desired future trend toward a more stabilized stream system.

3.1.D.1 Physical and Biological Characteristics

Lamb Creek is a 3rd order tributary on the west side of Priest Lake (Figure 2-2) flowing southeast to the Priest Lake outlet channel, just upstream of the outlet dam (Figure 3-7a). Main stem length is 12.8 miles, watershed size is 15,615 acres (Table 2-2), and there are approximately 31 miles of perennial streams. The lower half of Lamb Creek flows through a broad flat terrain, and the watershed is flanked on the south, west and northwest by mountains. Elevation ranges from 2,438 ft at the outlet channel to 5,476 ft at Gleason Mountain, but most mountain ridges are between 3,400 - 4,200 ft elevation. Average annual precipitation increases from 32 inches at the mouth to approximately 40 inches at high elevations. Precipitation is 25 - 50% snow with a snowmelt dominated runoff pattern. Peak flow is during mid-March through late April (Figure 3-8). The large area of gradual topography in the lower watershed ranging from 2,440 - 3,000 ft elevation does experience late winter rain-on-snow events with moderate rises in the hydrograph. USFS classifies around 45% of the drainage as having sensitive snowpack (USFS 1999).

Higher elevation lands of the north and west are granitic batholith, valley hillslopes and stream bottom lands are glacial outwash and till, and alluvial deposits, and the southern mountain ridge is belt rock, an extension of the geology of Binarch Creek watershed (Figure 2-4 and Figure 4-2). The general soil map of the west side Priest Lake basin describes the Lamb Creek bottom lands as Bonner soil, and the western higher slopes as Hun - Jeru soils (Figure 2-5, Table 2-3).

Around 1890, the lower and upper drainage of Lamb Creek was burned in a large wildfire (Figure 2-6). Large fires between 1925 - 1939 burned sections of the western and northern hillslopes. Forest types in the watershed are currently dominated by Douglas-fir, grand fir/western hemlock, and western larch (USFS 1999). A portion of forested land currently has Douglas-fir beetle caused mortality.

The lower one-half of Lamb Creek is primarily gradual sloped Rosgen C4 and C5 channel type (Figure 3-7a), with a majority of this section less than 0.5% slope. This lower stream course has floodplains with riparian vegetation a mixture of alders, other shrubs, and a few reaches of dense conifer overstory. The lower watershed has wetlands, wet meadows, and upland meadows, with some of these lands converted to hay cropping, grazing, and residential/business development. Historically, a major area of the lower reach was likely a large contiguous wetland (USFS 1998a).

Depositional zones of the lower reach are often a thick layer of large grained sand. Channel habitat is often runs, glides and scour pools. Some sections have large deep pools of decent quality that provide overwintering habitat (USFS 1999). But often, pool quality is rated poor to moderate due to lack of instream cover. While there are some sections of large woody debris incorporated into the stream banks forming pools, overall there is insufficient LWD because of few recruitable conifer trees in the riparian zones. There are reaches of riffles, runs and pool tailouts with gravel and cobble suitable for spawning. Beaver dams and pools are common. Within the upper B and A channels, granite bedrock and boulders are part of the stream channel and there is often a good canopy cover.

Brook trout are abundant, and possibly the only salmonid in Lamb Creek. USFS believes that remnant cutthroat populations are present in upper headwater portions of Lamb Creek and Skip Creek (USFS 1998a), but no cutthroats were sampled by DEQ electro-fishing within an upper reach. In a 1956 survey, Lamb Creek was described as a typical brook trout stream with little value for cutthroat spawning (Bjornn 1957). It is likely that Priest Lake adfluvial bull trout once migrated into Lamb Creek, but they are probably not present now, and Lamb Creek is considered low priority in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

Figure 3-7a. Lamb Creek Watershed: streams, BURP sites, and gradients.

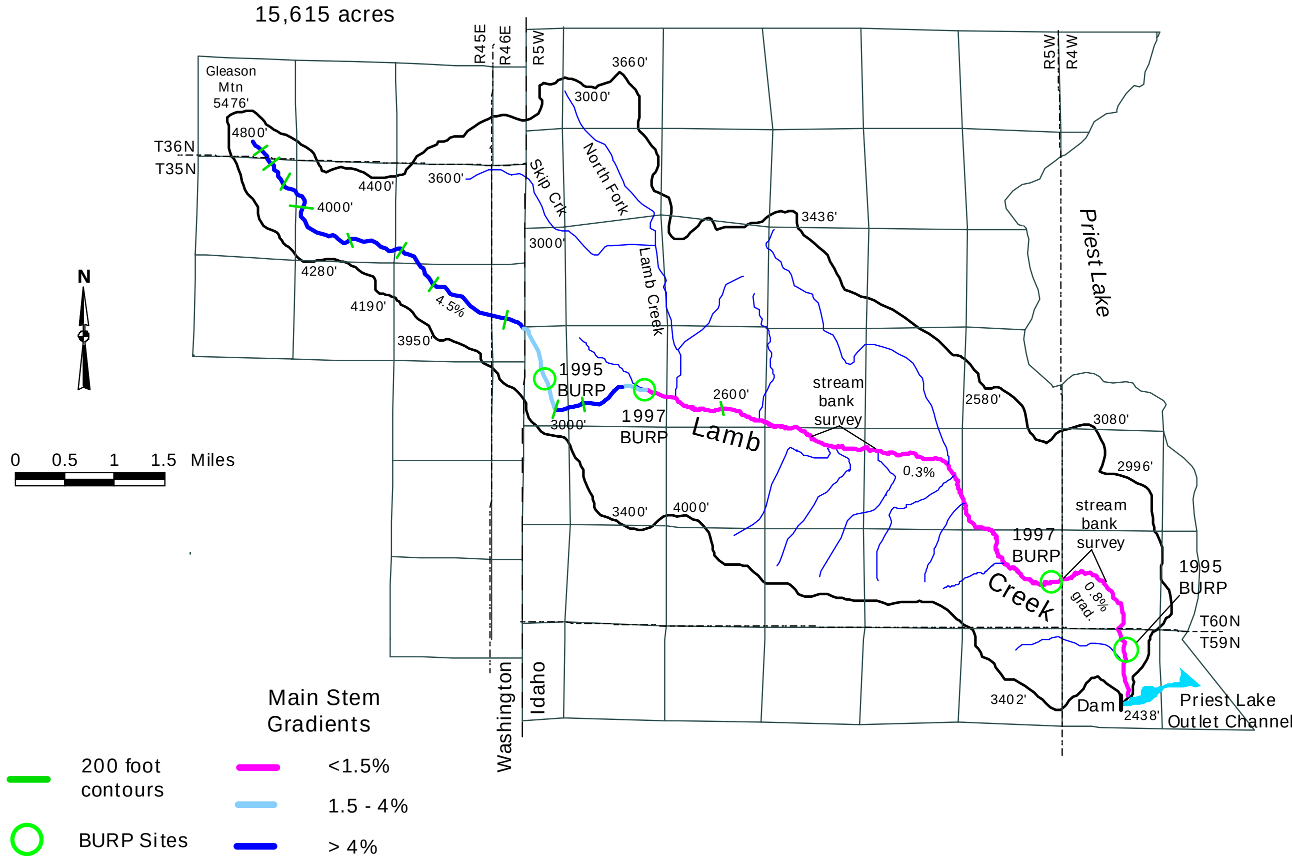


Figure 3-7b. General land use and ownership in the Lamb Creek Watershed.

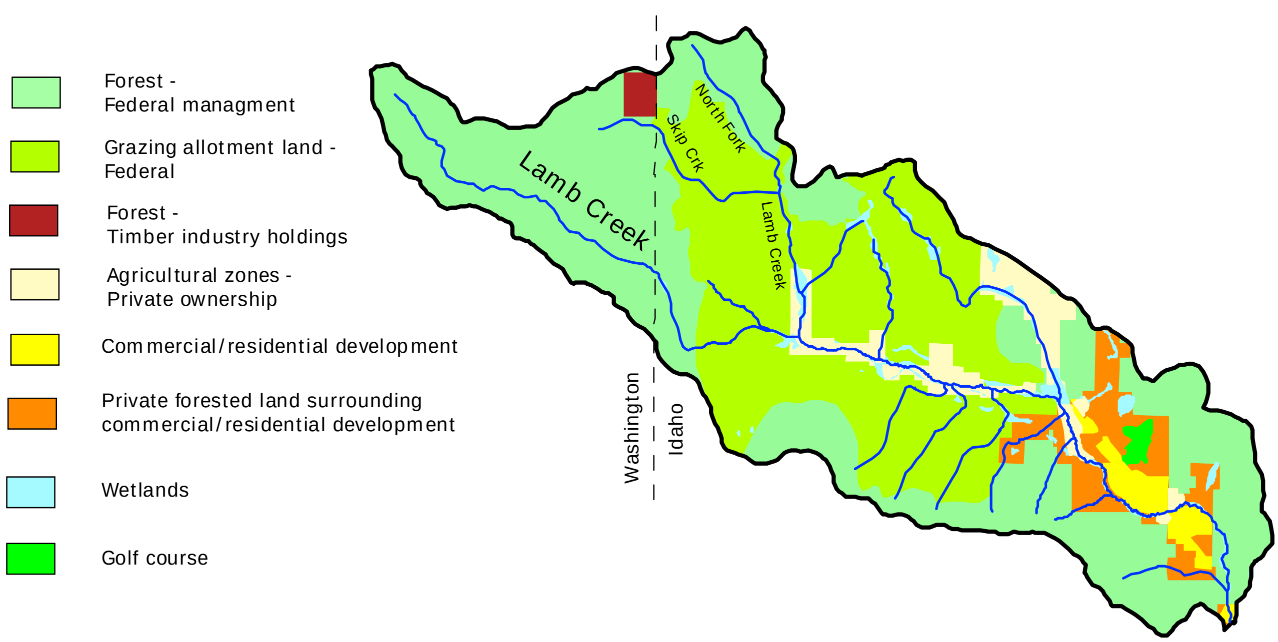


Figure 3-7c. Roads in the Lamb Creek Watershed.

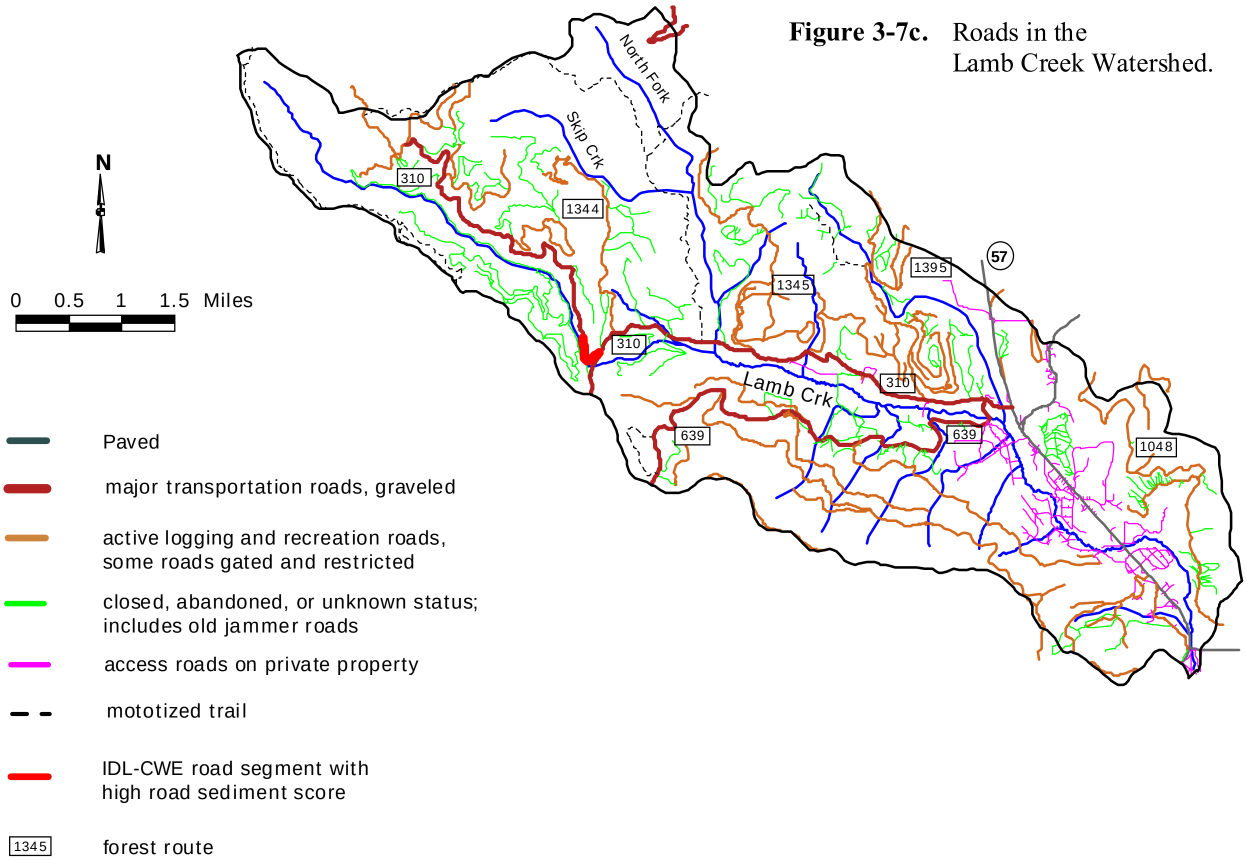
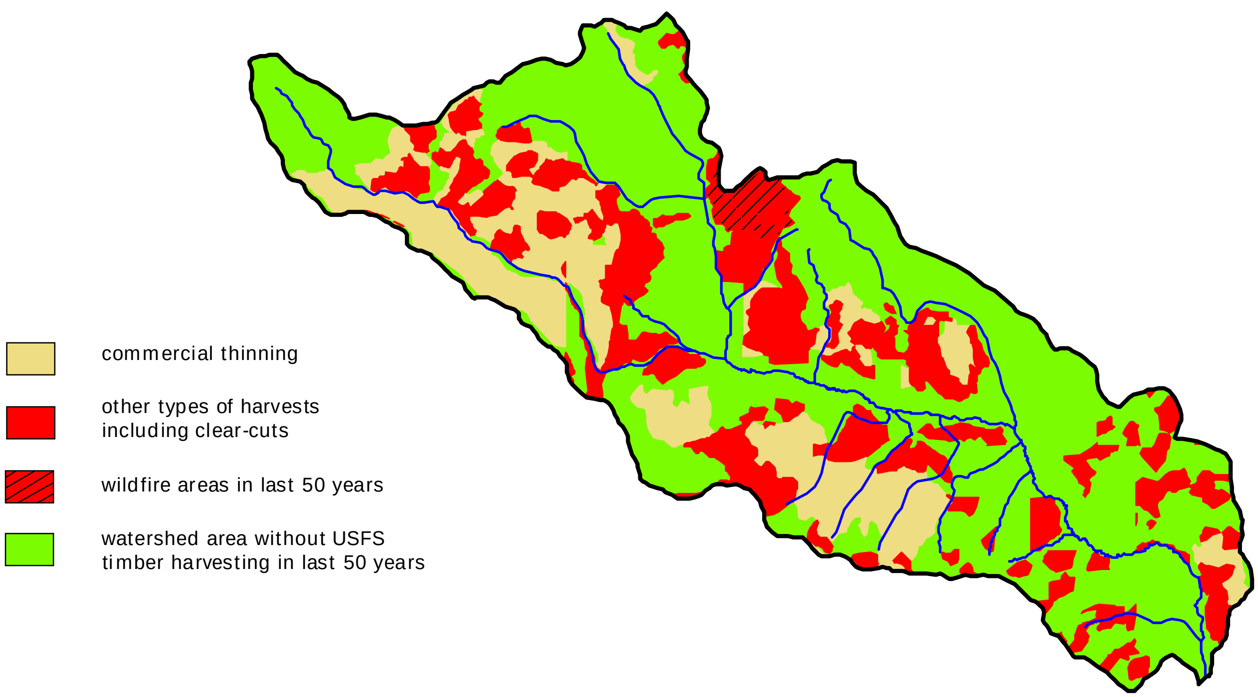


Figure 3-7d. Timber harvests in the Lamb Creek Watershed over the last 50 years; data supplied by the USFS.



3.1.D.2 Cultural Characteristics

Lamb Creek watershed is a mixture of federal lands and private ownership (Figure 3-7b). Within Idaho 2,200 acres are privately owned (14% of the drainage, Table 2-5). Land use on private ownership includes: urbanization within a 1,295 acre zone with development of the Lamb Creek commercial and residential area including subdivisions and a golf course, and also non-industrial timber harvesting which includes conversion of forested land to commercial and residential properties; and 903 acres of an agriculture zone with hay cropping, cattle grazing, and timber harvesting. A 100 acre block owned by industrial timber is located in Washington. The remaining 13,320 acres is under USFS management. Most of this land is managed for timber production, and there is a 6,722 acre grazing allotment.

Because of large fires between 1890 and 1926, historic logging was limited to salvage of fire-killed timber in the Lamb Creek watershed. The majority of timber harvesting has occurred since 1960, and most of this recent logging has been even-aged treatments such as clear-cut, seedtree, and shelterwood silviculture systems (USFS 1998a). It is estimated that around 35% of the drainage has been logged, and watershed road density is moderate to high.

3.1.D.3 Pollutant Source Inventory

Point Source Discharges
No point source discharges exist in the Lamb Creek watershed.

Nonpoint Sediment Sources

Fire and Historical Timber Harvesting - The USFS reports that related to large fires in 1925 and 1926, a large debris dam formed in the upper stretch of Lamb Creek during a heavy summer rain, and flood waters broke through the dam washing out bridges and culverts (USFS 1998a). The result was that the narrow upper B channel was scoured 20-40 feet wide with large boulders exposed. Lamb Creek still shows effects of this past flood. Another large fire occurred in 1939 burning western and northern headwater lands. Because of these fires only limited historic logging occurred in Lamb Creek, mainly within isolated parcels for salvage of fire-killed timber (USFS 1999).

Current Timber Harvesting, Roads and Stream Crossings - USFS reports timber harvesting activities over the past 50 years as follows (USFS 1998b, Figure 3-7d): in the lower Lamb Creek subwatershed, up to the confluence of North Fork Lamb Creek (7,625 acres), 47% of the subwatershed has been harvested primarily within the southern mountains; the North Fork drainage has had only minor harvesting activity, 16% of the drainage, but fires since 1900 have covered around 70% of the land; and the upper Lamb Creek subwatershed, from North Fork confluence to the headwaters (2,715 acres), has had 54% of the drainage harvested, almost exclusively along hillslopes north of the stream. USFS considers that the headwaters are currently transporting elevated amounts of sediment, and headwater reaches show indications of channel scouring from high water yields (USFS 1999).

DEQ GIS analysis of roads in the watershed produces a total of 150 miles (only 6 miles paved), for a moderate - high road density of 6.2 mi/mi^2 (Figure 3-7c). Density of active roads that are either open or have access controls is 4.1 mi/mi^2, well above the basin-wide average (Table 2-13). Of the 101 miles of active roads, 27 miles are unpaved access roads servicing private commercial and residential areas. An IDL - CWE assessment was conducted in 2000, and 35 miles of road were surveyed. Overall, sediment delivery was rated as "low", but a 0.4 mile stretch of Forest Road 310, adjacent to Lamb Creek upstream of the North Fork confluence (Figure 3-12c), was given a road sediment score of high.

Stream crossing density of the total road network equals 1.5 crossings/mile of stream (52 stream crossings). This would be in the high end compared basin wide.

Based on the sediment load calculations presented in Section 4, the total road network is estimated to increase sediment load over the natural forested land yield by 56% (assuming 100% delivery to streams). This loading for Lamb Creek seems low given the road and stream crossing density. The reason is that the sediment load calculation is based on IDL - CWE road sediment scores, and the average CWE scores for Lamb Creek were among the lowest of watersheds surveyed. As explored in Section 4, when comparing various methods of load estimates for roads and crossings, the IDL - CWE calculation method may be producing a significant underestimation. When adding in washouts at stream crossings and other mass failures along the road prism from USFS maintenance experiences, sediment load jumps considerably to 183% above background.

Encroaching and Riparian Roads - With the exception of stream crossings, very little of the Lamb Creek road network is within the 50 ft encroaching zone. One exception is an abandoned road along the upper one-third of the main stem. This 3.5 mile historic road, which is vegetating over, literally hugs the stream. Harvesting occurred in the riparian zone throughout this road stretch, along with skid trails. At one time this was likely a major source of sediment to Lamb Creek.

The total road network within a 200 ft zone of watershed streams (including stream crossings), equals 14.9 miles, or 0.4 mi/mi of stream, and active roads in this zone is 0.25 mi/mi of stream. Road density within private lands is ever-increasing which includes stream crossings and roads close to the stream.

Canopy Cover and Peak Flows - An IDL - CWE canopy cover map for Lamb Creek was not available at the time of this report. The USFS considers that due to historic fire, timber harvesting, conversion of wetlands and wet meadows to agriculture and urban growth, and because of floodplain constriction from constructed roads, peak flow and stream energy currently in Lamb Creek is greater than that under which the stream evolved. Effects such as bank cutting and flooding remain a problem (USFS 1998a).

Instream Erosion - A stream bank erosion survey conducted in 2000 (methods described in Section 4), assessed 0.85 miles of mid Lamb Creek, in-between Hwy 57 and the North Fork confluence. This reach was adjacent to a hay field, and had historic cattle access, although the reach is now fenced off from cattle. Of the total stream reach assessed, 15% of the length was found to have either one stream bank or both with evidence of a recent eroded condition. The reach overall was fairly stabilized with shrubs, grass, and a few stretches of conifers, although there were several old cattle access points that were still bare and eroding. A statistical work-up of the survey data leading to an estimate of lateral recession (data analysis by the NRCS, Sampson *pers comm*), produced a moderate erosion rate of 29 tons/stream mile/yr for the 0.85 miles assessed.

A downstream, 0.7 mile segment of Lamb Creek east of Hwy 57 was also assessed for bank erosion, and the length of eroding bank was only 6.3% of the total reach assessed, although the composite bank erosion rating factors were high (significant erosion when found). The estimate of erosion rate was 15 tons/stream mile/yr over the 0.7 miles assessed.

When applying the estimated instream bank erosion rates from the two segments assessed over 7.6 miles of gradual gradient main stem, the load becomes 164 tons/yr.

Agriculture - Around 900 acres of private land has been labeled as an agricultural zone, much of this land used for hay cropping and grazing. Some sections of lower Lamb Creek wetlands and wet meadows were cross ditched to improve land for farming. With ditching, the energy of a stream can increase as spring runoff to the lowlands is accelerated, thereby leading to stream bank cutting. The haylands are not generally a source of sediment, but occasionally the lands are tilled and sediment laden runoff has been observed from these newly tilled lands. There are approximately 100 head of cattle grazing on private land and federal allotments. Many stream reaches are fenced, some are not. There have been observations where direct cattle access has caused stream bank failures and erosion, and riparian vegetation is thin due to trampling and grazing. There is a single agricultural land owner in the watershed, and this owner has been very active in local water quality issues.

Urbanization - About 3 miles of lower Lamb Creek flows through private lands where there has been impact by commercial and residential development. There is impervious and semi-impervious developed land that accelerates stormwater runoff to the stream. Each year new excavations lead to loosened soil which becomes incorporated as suspended sediment in the spring runoff. Some home and business developments have encroached onto the Lamb Creek floodplain and removed riparian vegetation. Observed results have included destabilized and eroding stream banks.

3.1.D.4 Summary of Past and Present Pollution Control Efforts

See Section 2.4.2, page 60, for USFS Forest Plan. Through timber sale receipts obtained from the Douglas-fir beetle project, USFS has scheduled watershed restoration activities within the Lamb Creek drainage including: 9 miles of timber road either reconstructed or obliterated; maintenance procedures over 19 miles of road including addition of relief culverts and rolling dips; and removal of three instream culverts (USFS 2001). Also, there has been a cooperative effort by the rancher in the Lamb Creek watershed to fence off additional stream sections to cattle access. Efforts are ongoing through implementation of the Priest Lake Management Plan to educate property owners on minimizing impact from new residential and commercial developments. In part, this means adherence to the existing Bonner County Stormwater ordinance, and for the lake plan Steering Committee to seek new regulations such as restrictions of vegetation removal within stream riparian zones.

3.1.D.5 Water Quality Concerns & Status

Refer to Table A-5 for the history of DEQ §305(b) and §303(d) listings for Lamb Creek; Table 2-6 for designated and existing beneficial uses; and Table 2-12 for determined support status of designated and existing beneficial uses.

3.1.D.6 Summary and Analysis of Existing WQ Data

A daily hydrograph was established for Lamb Creek for WY 94 and 95 from stream gauging and numerous flow measurements (Rothrock and Mosier 1997). Peak flow for WY 95 was from mid-March to mid-April at 80 - 90 cfs (Figure 3-8). Peak runoff was associated with maximum air temperatures between 40 – 65°F and spring rains. Summer base flow is around 5 - 10 cfs. The annual volume of water delivered from Lamb Creek in WY 95 was estimated at 16,100 ac-ft.

A total of 29 water quality sampling runs were conducted between 1993 - 1995. During peak flow there can be a relatively high (for the lake basin) suspended sediment concentration. Maximum TSS sampled was 64 mg/L (40 NTU turbidity). Associated with this suspended sediment sample was a maximum total phosphorus of 95 *u*g/L. Spring runoff mean TP was 32 *u*g/L. In base flow conditions TP is relatively high for lake basin streams, averaging 21 *u*g/L, and so is total nitrogen, averaging 290 *u*g/L. At the sampling station near the mouth of Lamb Creek, cobbles are covered by attached algal growth and aquatic plants (macrophytes), possibly responding to these nutrient conditions. Again, west side lake basin streams show higher nutrient concentrations in part related to substantial acreage of wetlands, wet meadows, and pasture converted from wetlands and wet meadows. The degree of algal and macrophyte growth observed at the sampling site is not considered an exceedance of the Standards Narrative criteria for excess nutrients.

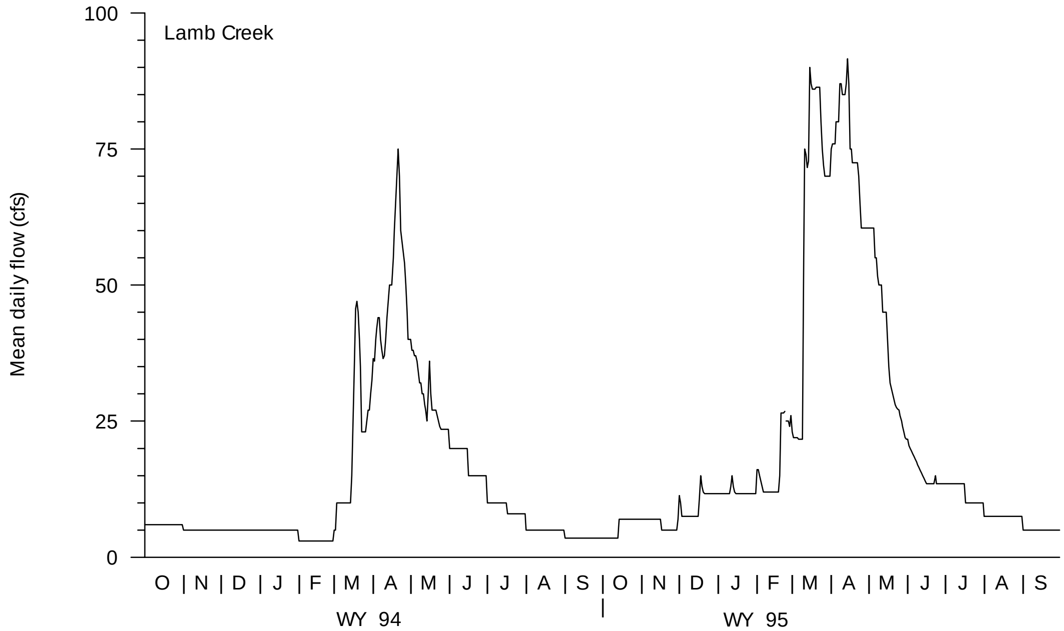


Figure 3-8. Mean daily flow rate for Lamb Creek, water years 1994 and 1995.

Numerous instream measurements were taken of pH and DO with no numeric criteria exceedances. Only instantaneous temperature readings were taken in Lamb Creek, and maximum temperature recorded was 16°C.

Thirteen samples were taken for fecal coliform bacteria. The maximum bacteria count was 270 FC colonies/100 ml, and all other results ranged between <1 - 50 FC/100 ml.

The 1995 BURP MBIs were 3.7 for a lower site and 4.2 for an upper site (Figure 3-7a). In 1997 at nearby lower and upper sites, MBIs were both 3.4.

The electro-fishing effort by USFS in 1995 was near the mouth. There were 19 brook trout sampled for a density of 9.5 fish/100 m^2, with three age classes including juveniles. Dace and sculpin were also sampled. No cutthroat trout were captured. DEQ electro-fishing in 2000 at the BURP 1997 lower site resulted in 12 brook trout/100 m^2 with 3-4 age classes, no cutthroat trout captured, and abundant sculpins. Electro-fishing at the BURP 1995 upper site produced 20 brook trout/100 m^2, with no cutthroat or sculpins. Lamb Creek is under general IDFG fishing regulations unlike the restricted fishing regulations from Kalispell Creek north.

The BURP Habitat Index scores from the two lower sites were HI=72 for 1995 (C channel), and HI=97 for 1997 (B channel). In the C channel section, scores below mid-point included 60% fines, marginal instream cover, high embeddedness, a poor slow/fast ratio of 0.1, and poor lower bank stability. In the lower B channel reach there was a decent slow/fast ratio of 0.8, fair instream cover, moderate embeddedness, but a high 51% fines.

BURP HI scores in the upper two reaches, both B channels, were HI=97 and HI=99. Below mid-point scores were percent fines of 32% and 46%, poor slow/fast ratios of 0.04 for 1995 and 0.3 for 1997, and high embeddedness for the 1997 reach.

The 1992 DEQ Use Attainability survey documented overall, poor - medium habitat conditions. The lower site near the mouth was rated “just fair” for habitat score, with below mid-point scores including marginal instream cover, and high sand deposition and channel alteration. Bank condition, canopy cover, and

Table 3-5. Selected Measurements of USFS R1/R4 Habitat Procedure on Lamb Creek.

	Reach Identifiers and Mean Values						
Measured parameters	**1&2**	**3&4**	**5**	**6&7**	**8**	**9**	**Weighted Mean**
Reach length (m)	524	3191	1816	3336	1115	3307	--
Channel type	B5	B5	C5	C5	C5	C5	--
Slow/fast ratio	0.3	0.4	0.6	0.2	0.3	0.1	0.3
Wetted riffle+run width (m)	5.0	4.8	4.8	3.8	3.8	3.6	4.2
Residual Pool Volume (m^3/km)	142	236	294	72	88	20	133
Number of pools/100 m	1.9	1.7	2.6	1.7	2.2	0.8	1.6
Percent fines	50	53	68	27	80	38	53

riparian condition were rated good. Residual Pool Volume was 122 m^3/km, below average for the 3-5 m wetted width basin wide group. A middle reach site rated "poor" in habitat score, with poor instream cover, bank stability, pool complexity, and high sand deposition and riparian disruptive pressures (grazing). RPV was very poor at 2 m^3/km.

In October 1997 the USFS conducted a R1/R4 Fish Habitat Inventory Procedure on 8.3 miles of Lamb Creek. Stream habitat measurements were developed into slow/fast ratios, RPV, pool frequency, and percent fines by Wolman Pebble Count. The R1/R4 Inventory was conducted in 9 reaches, and a summary of the data is presented in Table 3-5.

Data and field notes from the R1/R4 Inventory presents a wide variety of conditions, ranging from: good habitat with quality pools, abundant LWD and canopy cover, and good gravels for spawning, to the other extreme of wide sandy bottoms with poor spawning habitat, poor frequency and quality of pools, low LWD, and stream banks eroding due to home lot development, cattle crossings, and stream energy. Overall, for the 3-5 m wetted width basin data set, a weighted mean average of 1.6 pools/100 m and RPV of 133 m^3/km are well below the basin average. Pool formers were 57% meanders (lateral scour), and 35% LWD. Percent fines in riffles, runs and pools averaged a high 53%. Throughout the R1/R4 notes there is mention of abundant brook trout with large fish size encountered.

3.1.D.7 Status of Beneficial Uses

The BURP MBI results for 1995 are Full Support for cold water biota beneficial use. The BURP MBI results for 1997 are Needs Verification. Examining the DEQ RIBI fish assemblage questions (IDEQ 1996), the 1997 results for Lamb Creek would be NV due to the dominance of the introduced brook trout and absence of cutthroat trout. Continuing with the Determination Flow Chart (Figure 2-10), the 1997 HIs were just less than 100, so the status call remains NV.

Based on the USFS and DEQ electro-fishing surveys, the good densities of brook trout along with sculpins in the lower reach suggest that cold water biota is not impaired, or shows Full Support. While it may be argued that the absence of cutthroat trout is a clear sign of an impaired condition, there simply is no historic data available to judge what cutthroat population numbers may have been in Lamb Creek. There is no doubt however, that overall, Lamb Creek has poor to medium stream habitat conditions, due in part to an excess of sand bedload, along with other factors identified in this section such as insufficient instream Large Woody Debris along with a reduction of stream-side LWD recruitment. Current opportunities do exist to reduce the current sediment load into the stream.

The USFS and DEQ fish data shows Full Support for salmonid spawning beneficial use using brook trout for juveniles and two older age classes.

Sufficient fecal coliform bacteria samples were collected to assign FS to primary contact recreation. Domestic water supply use of Lamb Creek is isolated to single family residences, so the turbidity criteria does not apply. The toxic substance criteria was Not Assessed. There is insufficient water temperature data to judge exceedances of the various criteria.

3.2 §303(d) Listed Streams Proposed for Partial De-listing, with Sediment as the Listed Pollutant of Concern: Stream Segment Retained Needs Further Evaluation

A. Reeder Creek

Summary
Reeder Creek was added to the 1994 §303(d) list, and retained on the 1996 list, as a result of EPA analysis of the 1992 §305(b) report, Appendix D, in which IDFG and DEQ evaluated cold water biota as partial support and salmonid spawning as not supported. The listed pollutant is sediment. Reeder Creek was retained on the 1998 §303(d) List (IDEQ 1999).

BURP data were collected at two sites on Reeder Creek in 1995. The lower site MBI was 3.9, Full Support, and the Habitat Index of 105 is a good score. However, this site was near the mouth on an A channel gradient (Figure 3-19a), representing a 0.6 mile A and B channel reach. This BURP site is not representative of the primary, 5 mile mid-section that is a low gradient channel type flowing through wet meadow habitat. The MBI at an upper BURP site was also FS, but this site was in a B channel reach representative of the headwaters, above the main middle section. Up to 2000, there had been no fish sampling efforts documented for Reeder Creek. It was known that at least brook trout inhabit the stream.

In 2000 a BURP site was established within the middle section, just west of the Hwy 57 crossing (Figure 3-9a). Electro-fishing at this site produced a low-moderate density of brook trout with only 2 age classes represented. No cutthroat were captured, and the dominant species was speckled dace.

DEQ electro-fishing at the upper 1995 BURP site (in 2000), produced an extremely abundant brook trout density of 76 fish/100 m^2, with 3 age classes including juveniles. No other species were captured.

This SBA concludes that upper Reeder Creek, from the headwaters down to elevation 2680 ft, is Full Support of cold water biota and salmonid spawning beneficial uses, and should be de-listed with sediment as the pollutant of concern. This is based on MBI = 4.1, a thriving brook trout population, HI = 103, and minor land use disturbance in the upper watershed.

This SBA retains the portion of Reeder Creek from elevation 2680 ft to the mouth on the §303(d) list until the MBI results are completed for the middle section, as well as tabulation of the Habitat Index score. A beneficial use status call will be presented in the 2002 DEQ §303(d) List.

3.2.A.1 Physical and Biological Characteristics

Reeder Creek is a 2nd order tributary on the west side of Priest Lake (Figure 2-2), flowing south and then due east to the lake. Main stem length is 7.7 miles and watershed size is 8,454 acres (Table 2-2). The watershed can be divided into three sections. Within the lower one-half, east of Hwy 57, Reeder Creek is mainly a low gradient channel, 0.4 - 1% slope, flowing through a broad floodplain of wetlands and wet meadows. Riparian vegetation is alders and willows with some conifer overstory, and the stream bottom is sandy-silt. The last one-half mile gets steeper with B and A channel type as the stream cascades down to the lake through Elkins Resort. The south side of this watershed section is mountainous, reaching an elevation of 4,074 ft at Lakeview Mountain.

The middle watershed section is west of Hwy 57, and Reeder Creek flows through the broad floodplain of Bismark Meadows. While once a contiguous wetland and wet meadows, a portion of this lowland has been converted to hay cropping and grazing. Reeder Creek gradient is less than 0.5% in this section, and portions of the stream have been straightened. The riparian zone is primarily shrub overstory with abundant grasses and forbs, and channel type is D, G, and E (USFS 1994 file notes). The stream bottom is sand-silt-muck.

The 2.3 mile reach of B and A channel of the headwaters flows due south through conifer canopy. The upper watershed reaches an elevation of 4,729 ft at Reeder Mountain. Northeast of the headwaters is a chain of the small Reeder Lakes. It seems that only the lower-most lakes have a hydrologic connectivity to Reeder Creek (USFS 1994). To the west of the headwaters is Indian Creek, a small stream that flows into Reeder Creek. Throughout Reeder Creek, beaver dams and ponds are common.

Average annual precipitation increases from 32 inches at the mouth to approximately 35 inches at high elevations. Precipitation is 25-50% snow with a snowmelt dominated runoff pattern. Peak flow is during the period of mid-March through late April (Figure 3-10). The large area of gradual topography in the lower watershed ranging from 2,440 - 3,000 ft, experiences mid to late winter rain-on-snow events with moderate rises in the hydrograph.

High elevation lands of the northwest are metamorphic belt rocks; a large mid section from the headwaters to the mouth is glacial till and outwash, alluvial deposits, and lacustrine laid sediment; and hillslopes to the southeast are granitic batholith (Figure 2-4). The general soil map of the west side Priest Lake basin (Figure 2-5) describes the Reeder Creek bottom lands as Bonner soil, the southeast mountain soils as Hun-Jeru, and the northwest mountain soils as Priestlake-Treble (Table 2-3).

Around 1890 almost the entire Reeder Creek drainage was burned in a large wildfire (Figure 2-6). Large fires between 1905 - 1939 burned sections of the southeast and northeast hillslopes.

DEQ electro-fishing in 2000 showed brook trout to be abundant in an upper reach, but low in density within a middle reach. From USFS field observations, and from accounts of local fishermen, it would seem that brook trout are abundant throughout the stream. Local residents have stated that a few cutthroat trout have been caught in Reeder Creek, but not in recent years. DEQ sampling did not capture any resident cutthroats, but some may reside in headwater habitat. It is uncertain if bull trout inhabited Reeder Creek historically, but they are probably not present now, and Reeder Creek is considered low priority in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

IDFG file records show that there was a Rotenone treatment of Reeder Creek in August 1960 for brook trout removal, followed by a plant of cutthroat fry (Fredericks *pers comm*).

3.2.A.2 Cultural Characteristics

Reeder Creek watershed is a mixture of federal lands and private ownership (Figure 3-9b). A substantial area of land is private (2,253 acres, 27% of the watershed). Land use on private ownership includes: a minor amount of urbanization with scattered single family residences, and a single small subdivision near the mouth of Reeder Creek; some non-industrial private timber harvesting; and a 900 acre brush/ agricultural zone with hay cropping and minor grazing. Two blocks of industrial timber lands (552 acres, Stimson Lumber Company) are located in the southeast hillslopes. The remaining 6,038 acres is under USFS management with most land managed for timber production, but federal land also includes flat brush fields and meadows. Federal land at the mouth of Reeder Creek is leased to Elkins Resort, with cabins and driveways immediately adjacent to the stream.

There has been a light - moderate level of timber harvesting in the watershed with an estimated 17% of the watershed being logged (USFS 2000a). Road density is moderate.

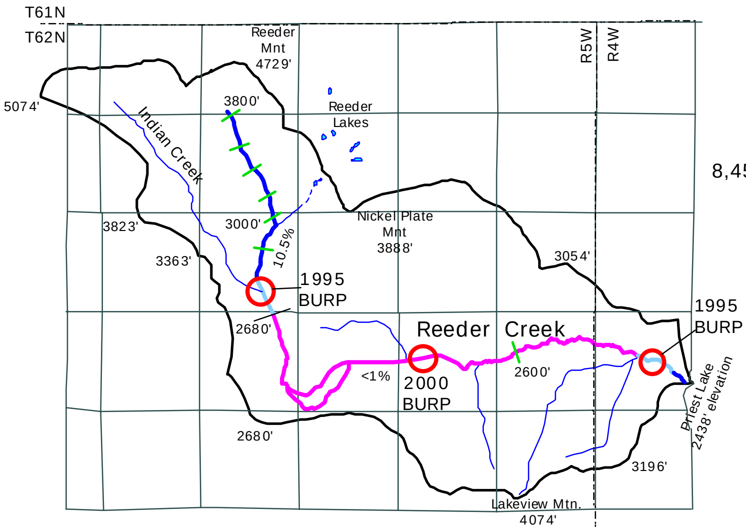


Figure 3-9a. Reeder Creek Watershed: streams, BURP sites, and gradients.

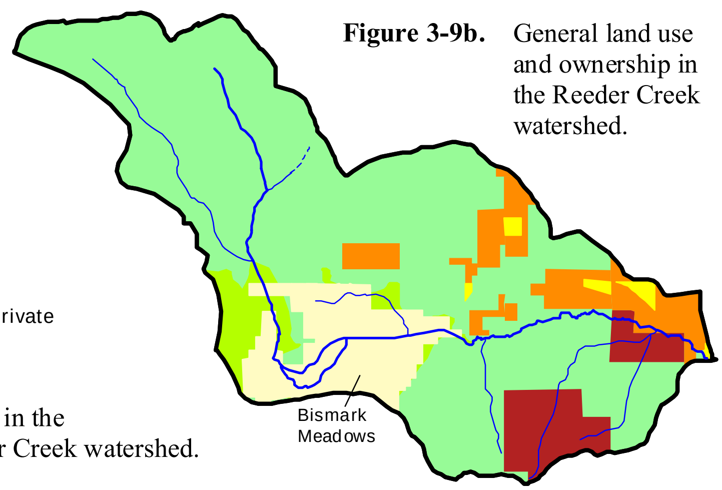


Figure 3-9b. General land use and ownership in the Reeder Creek watershed.

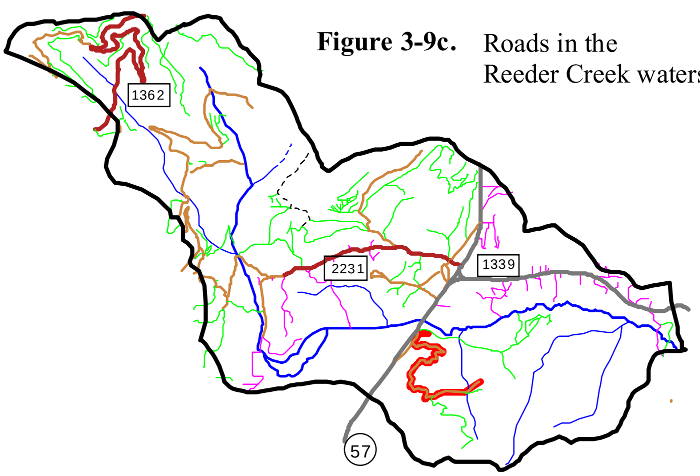


Figure 3-9c. Roads in the Reeder Creek watershed.

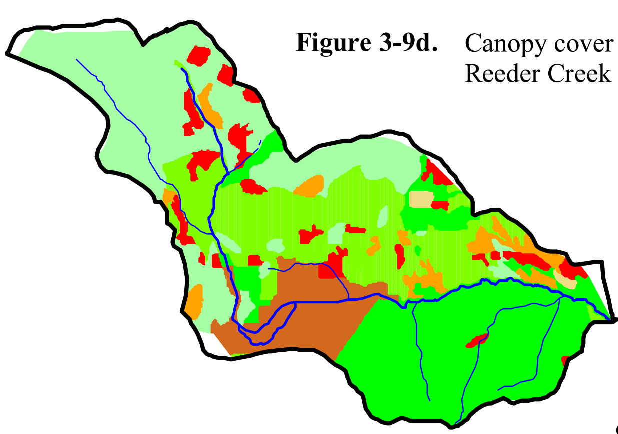


Figure 3-9d. Canopy cover of the Reeder Creek watershed.

3.2.A.3 Pollutant Source Inventory

Point Source Discharges
No point source discharges exist in the Reeder Creek watershed.

Nonpoint Sediment Sources

Mass Wasting - The 1999 IDL - CWE assessment assigned a "moderate" mass failure hazard rating to the watershed. A single mass failure was recorded during the CWE inventory.

Roads and Stream Crossings - DEQ GIS analysis of the road network shows 65 miles of total roads for a density of 4.9 miles/mi^2 (Figure 3-9c). Density of active roads that are either open or have access controls (including 5.7 miles of paved road) is a moderate 2.8 mi/mi^2. In the lower half of the watershed there are road miles which service resort and residential areas.

There are 16 stream crossings from the total road network for a density of 0.9 crossings/mile of stream. Riparian road length is low - moderate, estimated at 2.9 mi/mi^2 riparian area (USFS 2000a), below the basin average.

CWE assessments covered 11.5 miles of roads within the watershed. Most road segments inventoried rated "low" in sediment scores, but a 2 mile road stretch, southeast off Hwy 57, was given high erosion scores for cut and fill slopes, road surface, and sediment delivery (Figure 3-9c). Road scores from this segment resulted in an overall weighted CWE road score of 28, near the high range of "low".

Timber Harvesting and Peak Flows - There has been timber harvesting on federal land within the headwaters of Reeder Creek, and within private tracts of land along the northeast section of the watershed (Figure 3-9d). There has been some limited harvesting within Stimson Lumber Co. lands along the southeast mountains.

CWE assessments produced a 0.2 Canopy Removal Index on forested lands (Figure 3-9d). This would not include the large opening of Bismark Meadows. The Channel Stability Index was rated as "low" (favorable), and the Hydrologic Risk Rating was within the "low" range. Reeder Creek however does reach spring peak flow very rapidly (Figure 3-10).

Agriculture - About 700 acres of private land are classified as land for hay cropping and grazing. Animal units are estimated at about 100 head of cattle and 30 head of sheep, but some of this livestock grazing occurs in lands of the Kalispell Creek drainage. Historically, about 1.5 miles of Reeder Creek was straightened, and adjacent wetlands and wet meadows have had substantial cross-ditching for improvement of hay cropping. With loss of meander and floodplain function, stream energy has likely increased. Some stream reaches are fenced from cattle, some are not. USFS has noted some stream sections that have severe bank damage due to cattle access (USFS 1994).

Urbanization - There has only been minor impact to Reeder Creek associated with urbanization. There have been documented problems with sediment runoff into the stream from roads and excavation around Elkins Resort near the mouth, and also from a subdivision just upstream from the resort.

3.2.A.4 Summary of Past and Present Pollution Control Efforts

See Section 2.4.2, page 60, for Forest Plan of the Idaho Panhandle National Forests. There is a current effort underway, led by the IDFG, to establish the 1,200 acre Bismark Meadows under a federal Wetland Reserve Program (WRP). Land owner signatures have been obtained for WRP easement purchases. This effort is still in a preliminary stage with grant funding not secured, but if a WRP is established this will help restore wetland functions to the 3.5 miles of middle Reeder Creek that flows through Bismark Meadows. There would be elimination of the cross-drain ditches, allowance for meander to be restored, and riparian shrub plantings. For middle Reeder Creek, these are far more significant factors for improving stream health than impacts from the current sediment load.

3.2.A.5 Water Quality Concerns & Status

Refer to Table A-9 for the history of DEQ §305(b) and §303(d) listings for Reeder Creek; Table 2-6 for designated and beneficial uses; and Table 2-12 for determined support status of designated and existing beneficial uses.

3.2.A.6 Summary and Analysis of Existing WQ Data

A daily hydrograph was established for Reeder Creek for WY 94 and 95 from stream gauging and numerous flow measurements near the mouth (Rothrock and Mosier 1997). Peak flow for WY 95 was from mid-March to late April at 55 - 65 cfs (Figure 3-10). Peak runoff was associated with maximum air temperatures between 40 - 65 °F and spring rains. Summer base flow is around 3 - 5 cfs. The annual volume of water delivered from Reeder Creek in WY 95 was estimated at 14,270 ac-ft.

A total of 30 water quality sampling runs were conducted between 1993 - 1995. During peak flow suspended sediment concentrations were moderate, with a maximum TSS of 21 mg/L (10 NTU turbidity). Associated with this suspended sediment sample was a maximum total phosphorus of 45 *u*g/L. Mean TP during spring flow was 20 *u*g/L. In base flow conditions TP is somewhat above average for lake basin streams, with an mean of 14 *u*g/L, and so is total nitrogen averaging 265 *u*g/L. Like other lake basin west side streams, Reeder Creek has substantial acreage of wetlands, wet meadows, and pasture converted from wetlands and wet meadows. Vegetative decay and soil characteristics of these lowlands produce surface water and groundwater with above average phosphorus, and relative high dissolved inorganic and organic nitrogen, iron, and tea colored to reddish brown colored water from iron and organics.

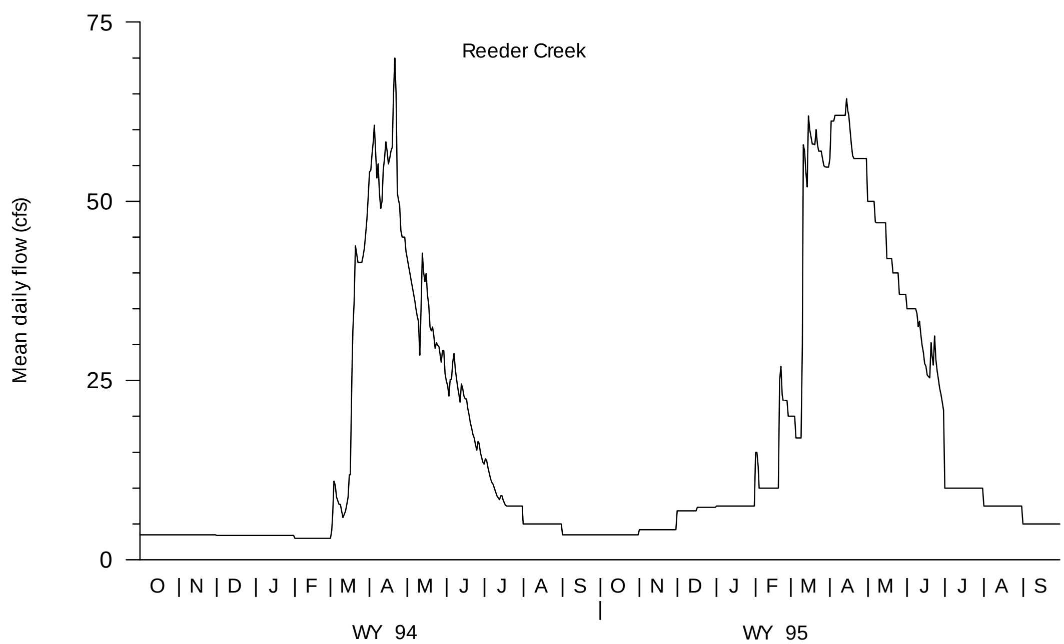


Figure 3-10. Mean daily flow rate for Reeder Creek, water years 1994 and 1995.

Numerous instream measurements were taken of pH and DO with no numeric criteria exceedances. Only instantaneous temperature readings were taken in Reeder Creek. Maximum temperature recorded was 15.6 °C. CWE stream canopy closure assessments did assign a temperature adverse condition to segments of Reeder Creek between the 2,440 - 2,800 ft contours, or the lower two-thirds of the stream.

During 1993 - 1995, thirteen samples were taken for fecal coliform bacteria near the mouth, as the stream enters Priest Lake. Reeder Creek is considered as primary contact recreation beneficial use near the mouth, since there may be swimming or wading activity from guests of Elkins Resort. The maximum bacteria count was 80 FC colonies/100 ml, and all other results ranged between <1 - 17 FC/100 ml.

As part of the revised BURP protocol, samples for *E. Coli* bacteria were taken in 2000 near the middle BURP site. Four samples taken from July 21 - August 16 ranged from 66 - 250 *E. Coli*/100 ml with a geometric mean of 113 *E. coli*/100 ml. This sample data is very near the Standards criteria of 126 *E. coli*/100 ml geometric mean of five samples over 30 days (Table 2-10). Mid summer *E. Coli* sampling near the lake should be conducted in 2001 to test against the 5 sample geometric mean criteria.

The BURP MBI for the lower site was 3.9, and for the upper site MBI = 4.1. The MBI for the 2000 BURP site is not available for this report.

DEQ electro-fished Reeder Creek in 2000; one reach at the middle BURP site and another survey at the 1995 upper BURP site. The middle site had a brook trout density of 4.1 fish/100 m^2 with two age classes including juveniles, no cutthroat or sculpins sampled, and abundant speckled dace. The upper site had an extremely abundant brook trout population of 76 fish/100 m^2, but no cutthroat or sculpins captured.

The BURP HI score for the 1995 lower BURP site was 105. Below mid-point scores were 24% fines, a slow/fast ratio of 0.1, and 50% bank vegetation. For the upper site, HI = 103. The only below mid-point scores were 46% fines and a slow/fast ratio of 0.1. The HI score for the 2000 BURP site has not yet been tabulated. The stream reach was within flat gradient, wet meadow - hay crop land, and characterized by: numerous drainage ditches coming into the stream; predominately a silty muck bottom; undercut banks; a riparian edge of mainly grasses and forbs with just a few shrubs; a habitat distribution of pools and runs with a pool/run ratio 0.24; and a good pool quality index because of undercut banks and instream cover. The 1992 DEQ Use Attainability survey assessed one site near the mouth. The overall habitat score rated "fair". Pool frequency was good at 6.2 pools/100 m, but the RPV of 178 m^3/km was below average for the 3 - 5 m wetted width group.

3.2.A.7 Status of Beneficial Uses

The BURP MBIs representing 0.6 miles near the mouth, and the headwaters section down to elevation 2680 ft, are Full Support for cold water biota beneficial use. Electro-fishing at the upper site showed a thriving brook trout fishery, supporting the FS for cold water biota, but no cutthroat trout were captured. Salmonid spawning for the upper BURP site is Full Support. Support status calls for the primary, middle low gradient reach will have to wait until MBI and HI scores are completed.

Sufficient fecal coliform bacteria samples were collected near the mouth in 1993 - 1995 to assign FS to primary contact recreation. However, *E. coli* sampling in 2000 at the middle BURP site was very near the Standards criteria. Domestic water supply use of Reeder Creek is isolated to single family residences, so the turbidity criteria does not apply. The toxic substance criteria was Not Assessed.

There is insufficient water temperature data to judge exceedances of the various criteria.

3.2.A.8 Data Gaps

A continuous temperature sensor should be placed within the lower half of Reeder Creek.

3.2 §303(d) Listed Streams Proposed for Partial De-listing, with Sediment as the Listed Pollutant of Concern: Stream Segment Retained Needs Further Evaluation

B. East River

Summary

East River was added to the 1994 §303(d) list, and retained on the 1996 list, as a result of EPA analysis of the 1992 Idaho §305(b) report, Appendix D, in which IDFG evaluated cold water biota as partial support and salmonid spawning as not supported. The listed pollutants are sediment, DO, temperature, and flow. The 1998 §303(d) List changed the boundaries of the East River listing to the North Fork (headwaters to Priest River), retained the North Fork on the list, and de-listed the Middle Fork from its headwaters to the confluence with the North Fork (IDEQ 1999).

There have been three BURP sites on the Middle Fork East River, and one BURP site on Keokee Creek, a tributary to Middle Fork. MBIs range from 4.0 - 4.4. This data along with Full Support for salmonid spawning beneficial use were the basis for §303(d) de-listing of the Middle Fork. There have been numerous fish surveys within the Middle Fork, and some if its tributaries, conducted by IDFG, DEQ, and IDL. Collectively these surveys show: cutthroat trout with density ranging from absent to low in lower reaches, and good to abundant in middle and upper reaches; the presence of bull trout throughout the Middle Fork main stem, mostly at low density but in a couple of tributaries density was adequate; and some brook trout and brown trout.

There was one BURP site in the East River main stem, and two on the North Fork. MBIs range from 4.0 - 4.4. There have been far less fish surveys within the main stem and North Fork. There was a very low salmonid density within the main stem from a single electro-fishing effort; and salmonid populations for the North Fork range from an absence of cutthroat and a dominance of brook trout in lower reaches, to adequate density of cutthroat in mid and upper reaches. No bull trout were captured.

There are data and observations which indicate poor to mediocre habitat conditions within the lower reaches of the Middle Fork, North Fork, and within the main stem, and the sediment load calculations suggest a moderate increase above background. Habitat and land use information includes: 1) DEQ instream habitat measurements and IDFG habitat observations indicating widened channels, low pool frequency and poor pool quality, along with poor stream bank conditions in the lower reaches, 2) stream bank damage within the main stem by large animal access, 3) fish data showing low or absent populations of cutthroat trout within lower reaches, 4) a moderate - high timber road density producing a current sediment load calculation of moderate over background, 5) an IDL - CWE analysis showing a moderate canopy removal index for the Middle Fork, and coupled with a channel stability index, resulted in a hydrologic risk rating on the high end of moderate, and 6) an IDL - CWE result of a temperature adverse condition for the lower reaches of both forks and the main stem.

Complicating the analysis for East River is a legacy issue of historic timber harvests within riparian zones where shade and LWD recruitment were effected, and sediment input from a road network constructed prior to the Idaho FPA. Also complicating an analysis is that comparing East River salmonid populations with eastern Priest Lake streams is difficult since East River is under only general angling regulations, while Priest Lake streams are under the more Restrictive Special Rules aimed at cutthroat preservation.

It is the conclusion of this SBA that the upper one-half of the Middle Fork East River is clearly in Full Support of cold water biota and salmonid spawning beneficial uses, and based on less data, this is also true of upper North Fork. It is determined that the lower reach of the Middle Fork is also Full Support based on adequate densities of brook trout, the presence of bull trout, and abundant sculpins. The lower reach of the North Fork has exhibited adequate densities of brook trout and brown trout to warrant Full Support.

This SBA supports the 1998 §303(d) de-listing of the Middle Fork for sediment. The North Fork East River, from its headwaters to the confluence with the Middle Fork, is also proposed for §303(d) de-listing with sediment as the listed pollutant of concern.

The 2.5-mile main stem, based solely on a single MBI would be Full Support under WBAG. But based on a single IDFG electro-fishing effort in 1986, the status is considered either NV or NFS for both cold water biota and salmonid spawning beneficial use. The main stem needs a current, more extensive fish survey, and DEQ BURP crews will do this during the summer of 2001. This SBA retains the main stem East River on the §303(d) list until analysis of the 2001 electro-fishing results. A beneficial use status call will be presented in the 2002 DEQ §303(d) List.

There is evidence to suggest that the lower reaches of the two Forks and the main stem are reflecting a Cumulative Effects within the entire watershed resulting from excess sediment, hyrdologic disequilibrium, historic riparian harvests, and possibly elevated water temperatures. Also, there is an elevated status for East River since apparently, this is the only known drainage of bull trout spawning and early rearing within the Lower Priest River subbasin. There are current opportunities for reduction of watershed sediment delivery and riparian improvement, from both public and private lands. Thus in Section 4, sediment source load calculations are presented for the East River drainage as an informational resource for any future interagency fisheries management efforts to strengthen both the cutthroat trout and bull trout populations.

In comment packages received to the draft SBA and TMDL, the IDL assessments concluded that the Middle and North Fork East River displayed Full Support of its beneficial uses and should be de-listed (IDL 2001). EPA analysis on the other hand recommended TMDL development for the North Fork (EPA 2001).

The East River is also listed for dissolved oxygen. The history of the DO listing is unknown. There have been no known measurements of DO taken within streams of this drainage. DEQ will measure DO at selected locations during the summer of 2001. The Middle Fork, North Fork, and main stem will thus remain on the §303(d) with DO as the listed concern. The status of the DO listing will be addressed in the 2002 DEQ §303(d) List.

3.2.B.1 Physical and Biological Characteristics

The entire East River drainage is 43,165 acres (Figure 2-2), and there are approximately 86 miles of perennial streams. The Middle Fork is a 3rd order stream, and watershed size is 21,788 acres (Table 2-2). The stream flows 9 miles almost due west until the confluence with the North Fork. Tributaries flow north and south except for Canyon Creek which flows west and comes into the Middle Fork just prior to the confluence. The North Fork is a 3rd order stream with a watershed size of 19,494 acres. The stream flows 10 miles southwest to its confluence. Tributaries mainly flow north and south. Lost Creek is a major tributary which appears to contribute only a minor amount of surface water, or none at all, to the North Fork. Observations indicate that the mountainous flow of Lost Creek goes subsurface just southeast of Chase Lake as it enters the large, glacial outwash and till, flat terrain of Jack Pine Flats. Lost Creek may contribute subsurface volume to the North Fork. Figure 3-11a depicts a subdivision line for the North Fork which separates Lost Creek as a 6th order HUC. This subdivision results in a 6,308 acre Lost Creek subwatershed, and a 13,188 acre North Fork subwatershed. At the confluence of the North and Middle forks, the 4th order main stem flows 2.5 miles to the mouth at Lower Priest River. Subwatershed size of the main stem is 1,881 acres.

The Middle and North Forks originate in the Selkirk Mountain crest. Elevation ranges from 2,280 ft at the confluence of the two forks to 6,706 ft at Mount Casey. The mouth of the main stem is at 2,230 ft.

Figure 3-11a. East River Watershed: streams, BURP sites, and gradients.

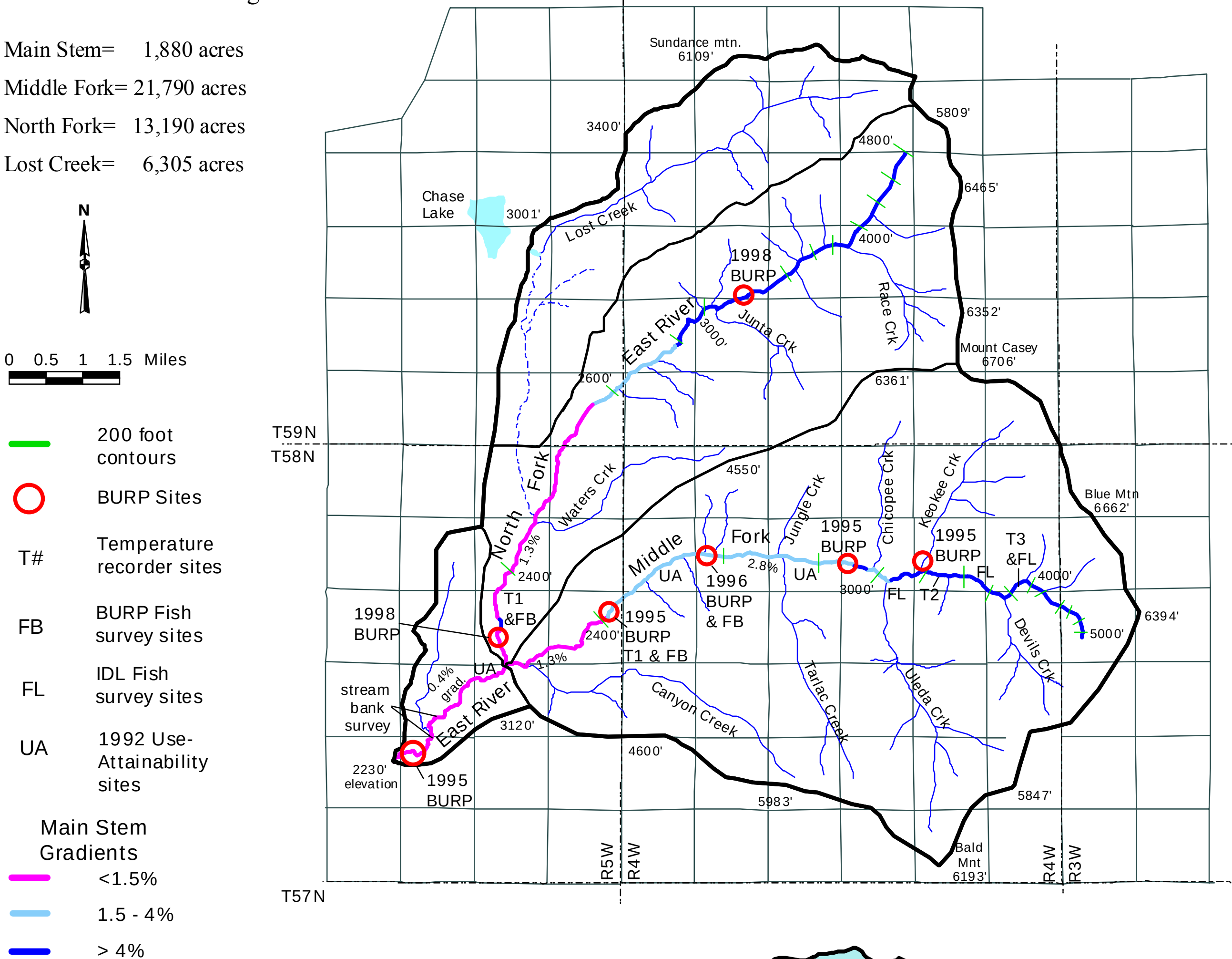


Figure 3-11b. General land use in the East River Watershed.

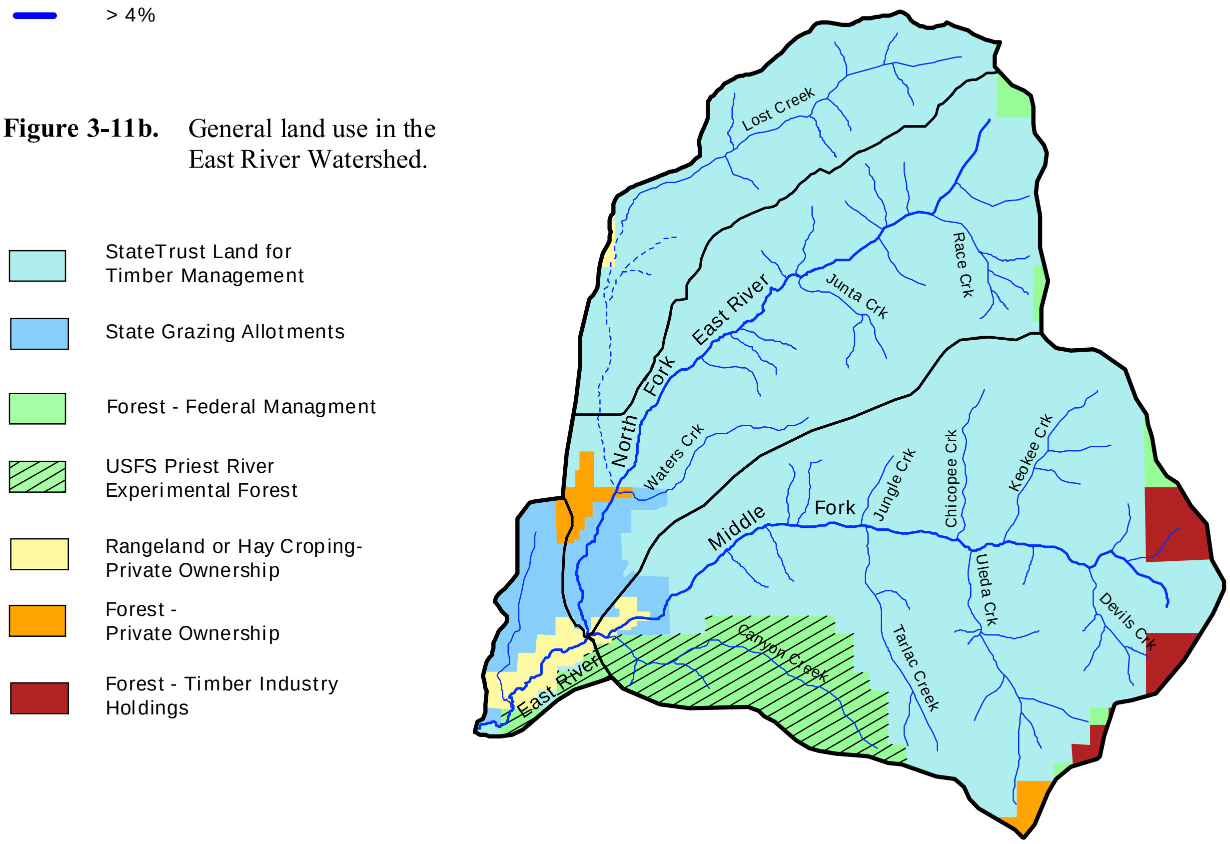


Figure 3-11c. Roads in the East River watershed.

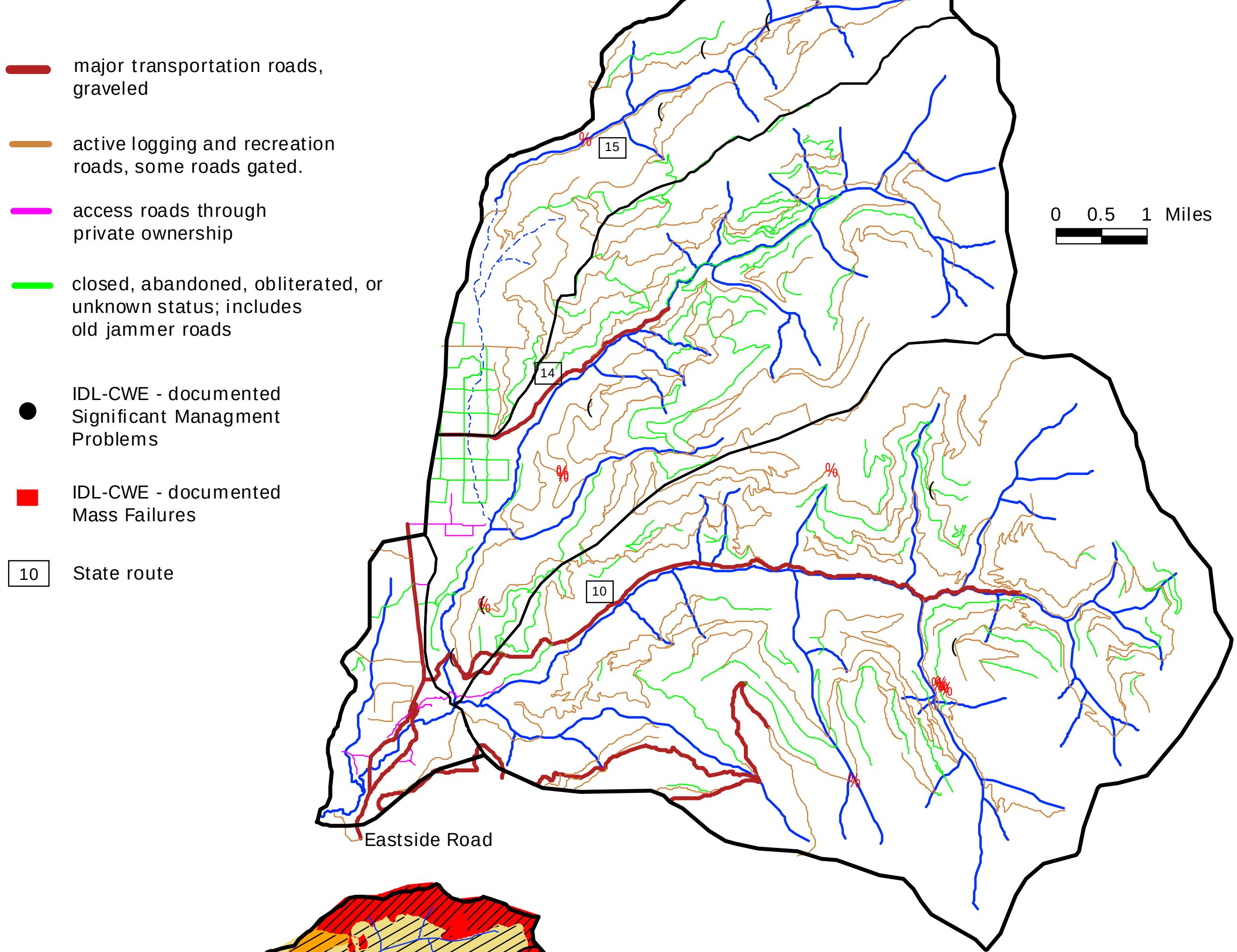
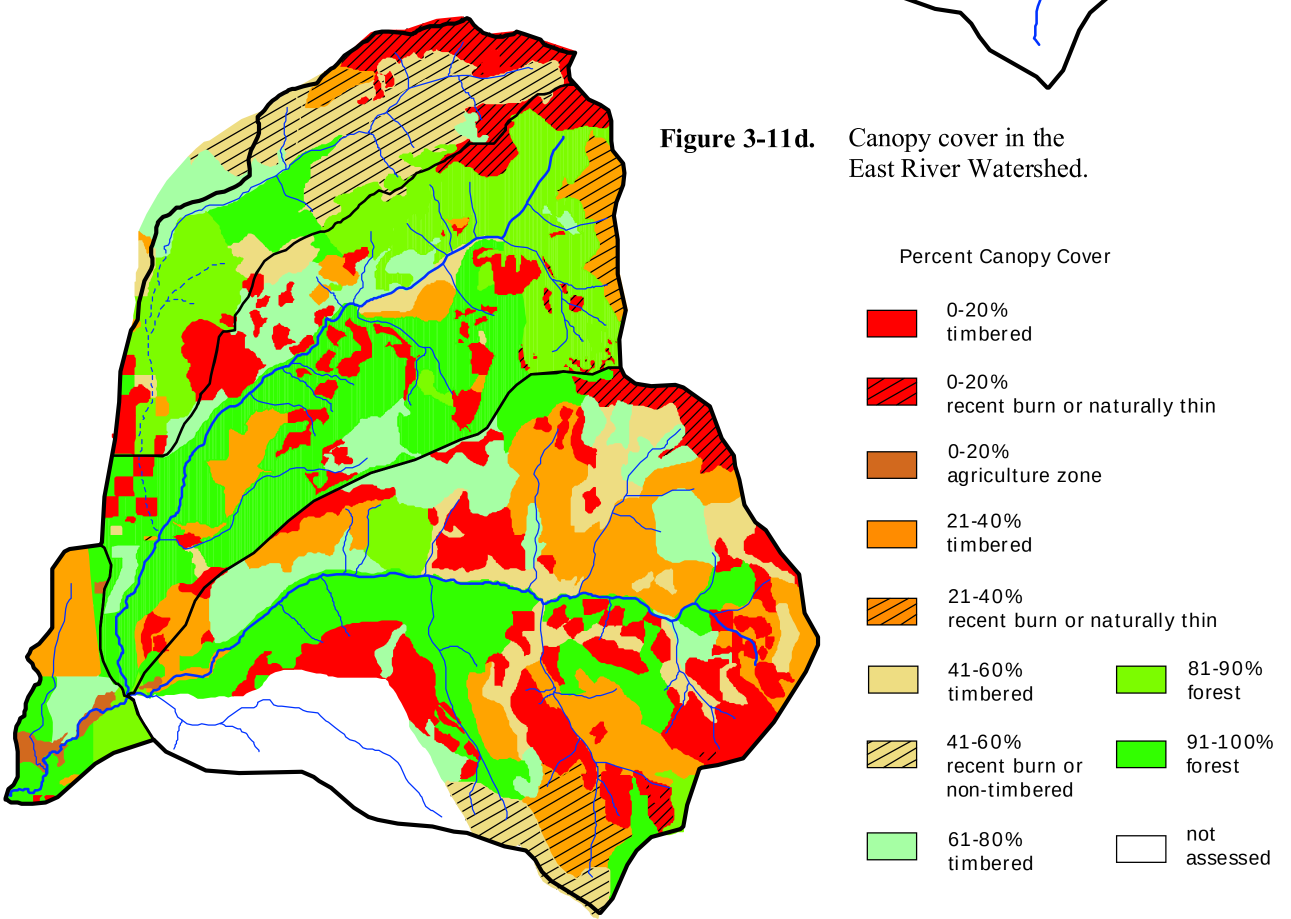


Figure 3-11d. Canopy cover in the East River Watershed.



Like east side streams tributary to Priest Lake, the upper watersheds are characterized by steep, highly confined, bedrock, boulder, first and second order streams that quickly combine into the 3rd order Middle and North Forks.

Average annual precipitation increases from 32 inches at the mouth to 40 - 50 inches at high elevations. Precipitation is mostly snow with a snowmelt dominated runoff pattern. A hydrograph has not been established for East River. Based on hydrographs for WY 1994 and 1995 established by stream gauging and numerous flow measurements on Soldier Creek, the watershed just above Lost Creek (Rothrock and Mosier 1997), high flow occurs between mid-April to late May. Soldier Creek peaks earlier than more northerly east side streams, in part because of a higher percentage of lower elevation, rain-on-snow sensitive acreage. Late winter rain-on-snow runoff events did produce moderate rises in the hydrograph at Soldier Creek. Caution must be taken on extrapolating East River flows from Soldier Creek because of the large stand-replacing Sundance fire that occurred over much of the upper Soldier Creek watershed in 1967.

Parent geology of the eastern two-thirds of East River watershed is granitic batholith (Figure 2-4). The general soil map depicts the higher eastern slopes to be Rock Outcrop - Prouty Jeru, while the mid-watershed slopes are Vay-Ardtoo-Lenz (Figure 2-5, Table 2-3). The lower-most stream valley of the Middle Fork, the lower one-half of the North Fork stream valley, and the main stem, is glacial till and outwash, and alluvial deposits, Bonner general soil type. There is a discrepancy between the USGS geology map of Figure 2-4, and the USFS land type map of Figure 4-2. In the USFS map there is a wide ban of residual belt rock spanning the lower one-third of the Middle and North Fork drainages.

The large Sundance fire of 1967 encompassed the higher elevations of the Lost Creek watershed (Figure 2-6). An early 1900s large fire also occurred in upper Lost Creek. There have been no other extensive stand-replacing wildfires in the East River drainage over the last 100 years.

The entire 2.5 miles of the main stem is very gradual sloped, ≤0.5% (Figure 3-11a). Historically the main stem course was likely a large floodplain with a high degree of meander. However, except for the lower-most 0.5 miles, the main stem now runs through private property where wetlands and wet meadows have been converted to pasture lands. The initial 1.8 miles of the Middle Fork averages 1.3% gradient, then 4.4 miles of 1.6 - 4.5% B channel, and then 5 - 10% A channel headwaters. The North Fork has a long 4.1 mile stretch of mostly 1 - 1.4% gradient, followed by a short B channel section, and then a 4 - 12% A channel upper reach.

A common reach type in upper segments is a substrate of bedrock and boulders, including falls and cascading rapids. There are substantial reaches of gradual sloped channel that are sediment depositional zones, including ponds behind beaver dams. There are reaches of riffles and pool tailouts that have good quality gravel for spawning. There are C channel floodplain sections along the main stem, lower-most Middle Fork, and lower one-half North Fork.

Fish surveys within the Middle Fork show varying results, with cutthroat trout as the dominant salmonid in some samples, brook trout as dominant in others. Cutthroat density has generally been low within lower reaches, and have ranged from low to abundant in middle and upper reaches. Brook trout are mostly sampled at low population numbers. The introduced brown trout are present, and bull trout have been sampled in the Middle Fork. In the North Fork brook trout are dominant, cutthroats have low density, and no bull trout have been captured. The Middle Fork is considered to support spawning and early rearing of bull trout, and is considered of high importance to bull trout recovery (Panhandle Basin Bull Trout TAT 1998a). Within the North Fork there is suspected spawning and early rearing of bull trout, and the North Fork is also considered of high importance to bull trout recovery.

3.2.B.2 Cultural Characteristics

The East River watershed is mostly State of Idaho Trust Land managed by IDL (87% of the watershed); 3,200 acres is part of the USFS Priest River Experimental Forest with Canyon Creek running through this land; another 516 acres, mainly on the eastern edge, is USFS and BLM land; and 1,926 acres is privately owned (Figure 3-11b). A total of 730 acres of private holdings is labeled as agriculture zones with hay cropping and grazing. An agricultural zone surrounds most of the main stem East River and lower-most Middle Fork. Residential development is mainly large acre rural lots, including hobby farms with grazing animals. There are 788 acres of private industrial timber lands, all on the eastern portion of Middle Fork. Most of the state owned land is managed for timber. There are 2,030 acres as State grazing allotment on the northern end of the main stem watershed, and surrounding the lower 1.5 miles of the North Fork. Recreation is popular in the watershed, with fishing, camping, hiking, hunting and snowmobiling.

The watershed has had considerable timber harvesting and road building since the early 1900s. Conifer canopy removal has been moderate to heavy within the Middle Fork, and low to moderate in the North Fork. Total road density is moderate.

3.2.B.3 Pollutant Source Inventory

Point Source Discharges
No point source discharges exist in the East River watershed.

Nonpoint Sediment Sources

Mass Wasting - The 1998 IDL - CWE assessment gives an overall mass failure hazard rating of moderate to the east river drainage. The mass failure sediment delivery scores to stream channels rated "low" for both the Middle and North Forks. During the CWE inventory, 11 mass failures were recorded, all from cut and fill slopes (Figure 3-11c). Several failures were rated as 90% delivery to streams.

Skid Trails - Nearly 100 skid trails in the East River watershed were examined and rated in the CWE assessments. Overall, skid trail sediment delivery scores rated "low" for both the Middle and North Forks.

Roads and Stream Crossings - GIS analysis of the road network provided by IDL produces a total of 147 miles of roads within the Middle Fork drainage, for a density of 4.3 mi/mi^2 (Figure 3-11c). This total likely includes some road mileage that has been obliterated but not recorded on the GIS files. Active roads that are either open or have access controls have a moderate density of 3.2 mi/mi^2. Frequency of stream crossings of the Middle Fork total road network is 1.4 crossings/mile of stream (60 crossings), above the basin-wide average (Table 2-13). The 1998 IDL - CWE inventory assessed 26 miles of road within the Middle Fork drainage. The mean weighted CWE road sediment score was 14, or "low".

Based on the sediment load calculations for the Middle Fork presented in Section 4, the total road network is estimated to increase sediment load over the natural forested land yield by 67% (assuming 100% delivery to streams, and not including road prism failures).

The CWE inventory recorded 7 mass failures within the Middle Fork and 2 Significant Management Problems (SMPs), and these were road segments with severe erosion or structural failures. When using the CWE mass failure occurrences at stream crossings and other sections of the road prism, including estimates of delivery to streams, sediment load increases to 145% above background.

GIS analysis of the North Fork road network (excluding the Lost Creek subwatershed but including the main stem drainage), produces a total of 120 miles of roads for a density of 5.1 mi/mi^2 (Figure 3-11c).

Active roads that are either open or have access controls have a moderate density of 3.1 mi/mi^2. Frequency of stream crossings of the total road network is 1.4 crossings/mile of stream (49 crossings). The 1998 IDL-CWE inventory assessed 35 miles of road within the North Fork+main stem drainage. The mean weighted CWE road sediment score was 14, or "low".

Based on sediment load calculations the total road network of the North Fork+main stem is estimated to increase sediment load over the natural forested land yield by 73%.

The CWE inventory recorded 3 mass failures within the North Fork, and 3 SMPs associated with road segments with severe erosion or structural failures. When using the CWE mass failure occurrences at stream crossings and other sections of the road prism, including estimates of delivery to streams, sediment load increases to 120% above background.

Encroaching and Riparian Roads - Existing transportation roads travel up the main stem channels within the watershed (Figure 3-11c). State Road 10 follows the Middle Fork up to the headwaters; State Road 14 follows the North Fork in its middle segment; and State Road 15 goes up Lost Creek. There is an older, closed road that hugged North Fork along its upper reach. There are also roads paralleling Uleda Creek and Waters Creek.

With the exception of stream crossings, very little of the East River road network is within the 50 ft encroaching zone. For the Middle Fork drainage, the total road network within a 200 ft zone of watershed streams (including stream crossings), equals 14.6 miles, or 0.34 mi/mi of stream, and active roads in this zone is 0.3 mi/mi of stream. For the North Fork+main stem drainage, the total road network within a 200 ft zone of watershed streams equals 10.2 miles, and density calculations are similar to the Middle Fork. Based on the USFS draft Geographic Assessment for the basin (USFS 2000a), the estimated riparian road density for the Middle and North Forks is around 6 mi/mi^2 riparian area, well above the basin-wide average (Table 2-13).

Timber Harvesting and Peak Flows - The calculated CWE canopy removal index (CRI) for the Middle Fork is 0.49 (Figure 3-11d). The CWE assessment did not include the Canyon Creek subwatershed (USFS Priest River Experimental Forest). The average channel stability index (CSI) was 47, or a moderate rating. Coupling the CRI with the CSI for the Middle Fork produces a hydrologic risk rating (HRR) at the borderline of "moderate" and "high". A high HRR rates a watershed as having a hydrologic adverse condition. The HRR rating, along with habitat data presented in the next section, may indicate stream channel impairment due to increases in peak flow discharge and sediment delivery.

The calculated CRI for the North Fork is 0.16 (excluding the Lost Creek drainage, and a CRI was not calculated for the main stem watershed). The average CSI was 50, or a moderate rating. Coupling the CRI with the CSI produces a HRR of "low".

Instream Erosion - A stream bank erosion survey was conducted in 2000, and surveyed 0.34 miles of the main stem just west of the Eastside Road stream crossing (Figure 3-11c). Of the total stream reach assessed, 89% of the length was found to have either one stream bank or both with evidence of a recent eroded condition. This reach as well as other segments of the main stem are known to have severe bank erosion due in part to damage by large animal access, but also by known problems of flow constriction by the Eastside Road bridge stream crossing, and as suggested above, possibly excess peak flow from the Middle Fork. The composite of bank erosion rating factors was high. A statistical work-up of the survey data leading to an estimate of lateral recession (data analysis by the NRCS, Sampson *pers comm*), produced a substantial erosion rate of 193 tons/stream mile/yr for the 0.34 miles assessed.

Agriculture - The primary stream segment impacted by commercial grazing is along the main stem, west of the Eastside Road bridge. Here, direct cattle access to about 0.3 miles of stream have lead to damaged stream banks that are sloughing and eroding, and very little shrub riparian vegetation.

Urbanization - East of the Eastside Road bridge is 1.4 miles of main stem, and 1 mile of the lower-most Middle Fork, that runs through private property where there has been development of several rural homesteads. Observations show access to the stream channel by cows and horses, conversion of wetlands and wet meadows by drainage channels, and substandard private roads and driveways.

3.2.B.4 Summary of Past and Present Pollution Control Efforts

See Section 2.4.1, page 59. In the IDL comment package to the draft SBA (IDL 2000), the following statement was included: "IDL has been very proactive in recognizing and correcting water quality problems that occur on its ownership in the East River drainage. We have been very active in improving the transportation systems within the tributaries of the East River. Main access roads have been surfaced with crushed rock, and rolling dips have been constructed to control surface runoff. Culvert sizes have been upgraded to prevent catastrophic failure. We have replaced several bridges using a spill through design that provides for a more natural stream flow than an abutment design. Non-surfaced roads have been heavily cross-ditched to prevent surface erosion. Gates or tank traps have been installed to control access on many of the non-surfaced roads. Many miles of old roads have been permanently abandoned, with culverts removed, and appropriate erosion control measures applied. Timber sales have been carefully planned to protect water quality and to ensure adequate shade and large woody debris is maintained within Stream Protection Zones. We will continue our efforts to maintain and improve water quality in the East River drainage whether or not a TMDL is developed."

3.2.B.5 Water Quality Concerns & Status

Refer to Table A-7 for the history of DEQ §305(b) and §303(d) listings for East River; Table 2-6 for designated and beneficial uses; and Table 2-12 for determined support status of designated and existing beneficial uses.

3.2.B.6 Summary and Analysis of Existing WQ Data

Hydrographs based on gauging stations and flow measurements have not been developed for the East River. Based solely on an acreage proportional basis with Soldier Creek, a peak flow for WY 95 for the Middle Fork calculates to 340 cfs, and the North Fork estimate is 200 cfs excluding Lost Creek. Again, based solely on the data from Soldier Creek, WY 95 annual flow volume into the Lower Priest River from East River calculates to a substantial 80,170 ac-ft (excluding Lost Creek). Summer base flow measured by BURP crews was 55 cfs in the main stem, 24 cfs on the Middle Fork, and 13 cfs on the North Fork.

There has been no water column sampling for suspended sediments and nutrients, and no known measurements for pH and DO. No samples have been collected for fecal coliform bacteria.

The BURP MBIs for East River sites have all been greater than 3.5 (Full Support). The results are as follows:

lower Middle Fork 1995	MBI = 4.4
mid-Middle Fork 1996	MBI = 4.2
upper Middle Fork 1995	MBI = 4.4
Keokee Creek 1995	MBI = 4.0
lower North Fork 1998	MBI = 4.4
upper North Fork 1998	MBI = 4.3
Main Stem 1995	MBI = 4.0

Table 3-6 presents data from electro-fishing and angling by IDFG in 1986 (Horner *et al*. 1987); electro-fishing by BURP crews in 1997 and 1998; and electro-fishing by IDL in 1998.

Cutthroat density in the Middle Fork from IDFG surveys had a decent average of 8 fish/100 m^2, but this was due to one upper reach with an excellent density of 24 cutthroat/100 m^2, averaged with two lower reaches of 0 and 0.3 fish/100 m^2. Cutthroats were not captured in the BURP survey at a lower Middle Fork site (Figure 3-11a), and density was only 0.4 cutthroat/100 m^2 within a middle reach. IDL surveys within upper Middle Fork sites and within Keokee creek, overall showed good cutthroat densities, on par with some east side tributaries to Priest Lake such as Two Mouth Creek and Indian Creek, and Big Creek just south of East River (Table 2-10)

Bull trout have been captured throughout the Middle Fork main stem, at low densities. A few larger fish captured were believed to be fluvial adult bull trout. Bull trout densities were decent in IDFG sampling within Uleda and Tarlac Creeks.

Brook trout density within the Middle Fork has been low to moderate. Sufficient age classes of brook trout were captured in the lower Middle Fork BURP survey to give Full Support for salmonid spawning beneficial use in that reach. BURP surveys also showed abundant sculpins in lower and middle reaches.

Within the North Fork, IDFG surveys found no cutthroat trout within four lower to middle reaches, but density averaged 3.2 cutthroat/100 m^2 in two upper reaches. Brook trout were dominant with a moderate average density, and brown trout were present. A single BURP electro-fishing within the North Fork at a lower reach, showed no cutthroat trout, a moderate density of brook trout assuming the unidentified salmonid young-of-the-year were brook trout, and a few sculpins. No bull trout were captured in either the IDFG or BURP surveys. The survey results would classify the North Fork as Full Support of salmonid spawning using the brook trout results.

Only a single fish survey has been conducted within the main stem, by IDFG. No cutthroat trout or bull trout were captured. Brook trout and brown trout were sampled at a very low density.

The BURP HI for the main stem site was 80, below the basin average. At this site, about 0.5 miles up from the mouth, below mid-point scores were instream cover, channel shape, slow/fast ratio, and a very poor wetted width/depth ratio of 45. Lower bank stability was poor and given a mark of 0, and there was significant land use impact on the banks and within the riparian zone. Percent fines were low at 10%.

Middle Fork HIs were 89, 95 and 94 for lower, mid and upper sites (Figure 3-11a). At all three BURP sites the slow/fast ratios were extremely poor at <0.1. The lower site had a poor width/depth ratio of 33. Percent fines were low to moderate, 11%, 28% (below mid-point), and 15% respectively.

The habitat score at the North Fork lower site was well below the basin average at HI=78. This reach had a poor width/depth ratio of 42, no pools encountered, poor instream cover, moderate percent fines (35%), and high cobble embeddedness. The upper North Fork site had a good habitat score of HI=110, but the slow/fast ratio was also very poor at <0.1.

The 1992 DEQ Use Attainability survey (Hartz 1993) assessed 1 site on the main stem, 2 sites on the Middle Fork, and no sites on the North Fork. The main stem site, just upstream of the Eastside Road bridge (Figure 3-11a), was rated "poor" for overall habitat quality. Low scores related to sand deposition, stream bank instability and erosion, and lack of riparian vegetation. There were six large pools, half created by large woody debris, the other half by lateral scour. Residual pool volume was 2,308 m^3/km, which was the highest volume of its wetted width group of 7.5 - 10 m.

Table 3-6. Results of Electro-fishing within East River: IDFG 1986 (Horner *et al.* 1987); DEQ BURP in 1997 and 1998; and IDL in 1998.

All Densities in fish/100 m^2

IDFG 1986 Species	Main stem	Middle Fork mean density	Middle Fork Range of 3 reaches	Tarlac Creek	Uleda Creek	North Fork mean density	North Fork Range of 6 reaches
Cutthroat trout	0	8.1	0-24.0	0	4.4	1.1	0-4.4
Bull trout	0	0.7	0-1.8	4.4	6.6	0	0
Brook trout	0.2	1.1	0-3.3	2.1	0	4.3	1.4-12.4
Brown trout	0.5	0.9	0-1.8	0	0	1.3	0-3.9

DEQ BURP[a]	lower Middle Fork - 8/97			mid- Middle Fork - 8/97			lower North Fork - 8/98		
Species	Trout No. <100 mm	Total No.	density	Trout No. <100 mm	Total No.	density	Trout No. <100 mm	Total No.	density
Cutthroat trout	0	0	0	1	4 (3 ages)	0.4	0	0	0
Bull trout	0	5	0.7	2	2	0.2	0	0	0
Brook trout	6	21 (4 ages)	2.9	5	17 (3 ages)	1.7	2	9	1.3
Brown trout	0	1	0.1	0	0	0	0	0	0
unidentified salmonid YOY	--	--	--	--	--	--	27	--	3.8
Slimy sculpin and *cotus* sp.	--	146	20.3	--	99	10.1	--	13	1.8
Dace	--	2	0.3	--	0	0	--	0	0

IDL 1998[a]	Upper Middle Fork - 3 Reaches			Keokee Creek - 2 Reaches		
	Mean No. of 0 yr.	Mean total density	Range of density	Mean No. of 0 yr.	Mean total density	Range of density
Cutthroat trout	2	11.6	3.6 - 17.5	1.5	18.0	17.5 & 18.9
Bull trout	0	0.4	0 - 1.2	0	0	0
Brook trout	0	0.4	0 - 1.2	0	0	0

a = DEQ BURP and IDL electro-fishing was one-pass only.

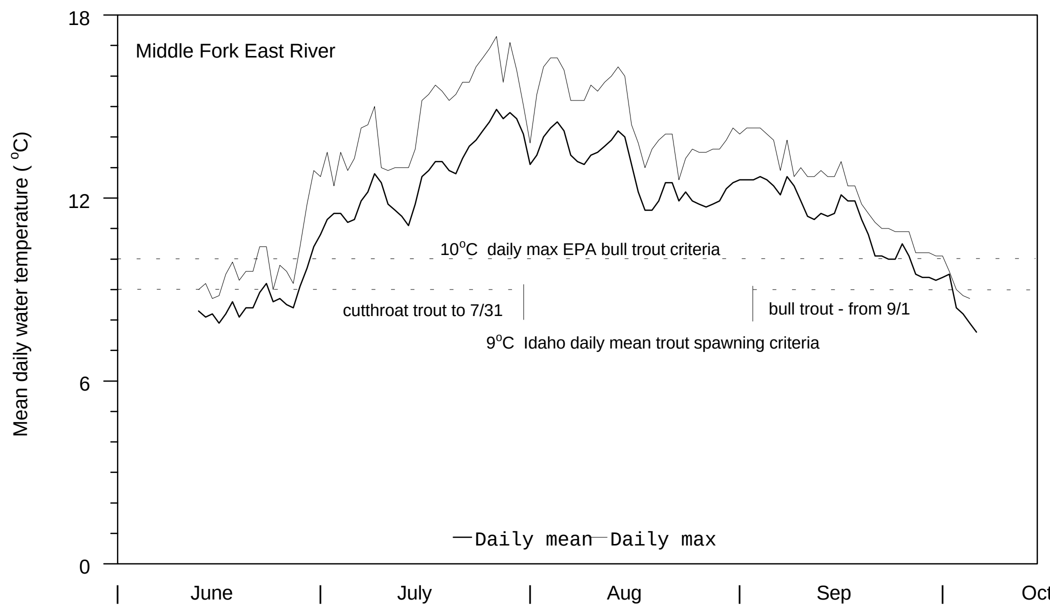


Figure 3-12. Mean daily and daily maximum water temperatures from June 13 - October 6, 1998 at Middle Fork East River, site #1.

A mid-Middle Fork UA site was rated as "fair" for overall habitat quality. Only one pool was encountered and thus a low RPV of 132 m^3/km. An upper Middle Fork site was rated as "good". Here there were four decent quality pools (4.7 pools/100 m), and RPV = 710 m^3/km was well above the average for the wetted width group of 5 - 7 m.

In IDFG general observations of stream habitat during electro-fishing surveys (Horner *et al*. 1987), it was noted that the main stem and lower Middle Fork lacked good quality riparian vegetation, that bank sloughing and erosion were common, and that there was a reduced quality of spawning gravels. Observations for lower East River also noted a low frequency of pools, and poor pool quality.

The overall condition of low pool frequency and low pool quality noted in all of the above habitat surveys may relate to insufficient recruitment of riparian large woody debris, which in turn may reflect historic logging practices of clear-cutting hemlock and cedar within riparian zones.

In 1998 IDL placed three HOBO® temperature sensors in the Middle Fork (Figure 3-11a for locations); one sensor in a lower reach, and the other two in headwater segments. Another sensor was placed in lower Keokee Creek. Hourly readings were tabulated from June 13 - October 6. Mean daily temperature at site 1 Middle Fork (lower reach), as well as daily maximum temperatures, are plotted in Figure 3-12. The Standards cutthroat spawning and incubation temperature criterion was exceeded on most days in July at sites 1, 2, and Keokee Creek, but only exceeded on 2 days at site 3 of Middle Fork. The EPA bull trout criterion was exceeded on most days from July - September at sites 1, 2, and Keokee Creek, but not at site 3. Mean temperatures for the period of record were 11.5, 9.1, 7.1, and 9.6°C at sites 1, 2, 3, and Keokee Creek respectively. Maximum hourly temperature recorded was 17.3°C at site 1.

In 1999 IDL again placed a sensor at lower Middle Fork site 1, and also a sensor within the lower section of the North Fork. Period of record was August 1 - September 20. Mean temperature for this period was 11.3°C for the North Fork and 10.5°C for the Middle Fork. Maximum hourly temperature was greater in the North Fork, 16.8°C compared to 14.6°C for the Middle Fork. The EPA bull trout criterion was exceeded on most days for the period of record.

DEQ placed a temperature sensor within the main stem from August 8 - October 23, 1997. Mean temperature was 13.5°C for August with a maximum hourly temperature of 18.1°C recorded. The EPA bull trout criterion was exceeded on all days for August and September.

The IDL – CWE, stream canopy closure/temperature assessment, evaluated the entire length of the Middle Fork and several of its tributaries. Of the thirty-two, 200 ft contour segments evaluated through aerial photography, 18 were given a high temperature rating. High temperature rating was assigned to the lower one-half of the Middle Fork, the entirety of Tarlac Creek, the lower one-half of Uleda Creek, and most of Devils Creek, Keokee Creek, and Chicopee Creek.

The CWE canopy closure/stream temperature assessment evaluated the entire length of the North Fork, and Waters Creek. Of the thirty-six, 200 ft contour segments evaluated, 11 were given a high temperature rating. High temperature ratings were assigned to about two-thirds of the North Fork length.

While not evaluated by CWE, the main stem would also have a high temperature rating due to agricultural and urban clearing of riparian vegetation.

BURP and Use Attainability surveys within lower and mid Middle Fork, and lower North Fork, recorded canopy closures ranging from 40 - 55% as measured by a spherical densiometer.

3.2.B.7 Status of Beneficial Uses

There have been no documented measurements of pH and DO for assessment of numeric criteria exceedances for cold water biota. Based on numerous measurements of pH and DO obtained within Priest Lake east side streams during the 1993 - 1995 lake baseline study (Rothrock and Mosier 1997), there is no reason to suspect exceedances of pH and DO within the East River drainage. However, the East River drainage will remain on the §303(d) list until DO measurements are obtained by DEQ.

The BURP MBI results score Full Support of cold water biota beneficial use for all segments of the East River drainage. IDFG, DEQ, and IDL fish surveys show Full Support of salmonid spawning beneficial use for the entirety of the Middle and North Forks. Based on a single IDFG electro-fishing within the main stem in 1986, the status call for salmonid spawning is Not Full Support. However, a more current and thorough fish evaluation is needed within the main stem to make a status call. Thus, salmonid spawning for the main stem is considered as Needs Verification.

When examining cold water biota beneficial use by WBAG+, using additional information of fish survey results, habitat evaluations, and various sediment load calculations from land use data, a conclusion might be drawn that the lower reaches of the Middle Fork and North Fork, and the main stem, have impaired cold water biota through Cumulative Watershed Effects including excess sediment. It appears that cutthroat populations are far less in density compared to upper reaches of the two Forks. There is an impairment to stream channels, and poor instream cover and pool frequency/quality in lower reaches. Habitat impairment might be a combined function of: sediment load; acceleration of peak flow within the Middle Fork due to canopy removal; reduction of riparian conifer vegetation related to legacy timber harvesting practices; and stream bank damage due to large animal access. Based on temperature sensors and the IDL - CWE Temperature Adverse Condition ratings, elevated stream temperatures may also be a factor if there is impairment.

However, the average of brook trout densities within lower and middle reaches of the two Forks appear adequate given the observed angling pressure. And, some bull trout continue to be captured in electro-fishing surveys within the lower reaches of the Middle Fork. Therefore, this SBA assigns Full Support to the entirety of the Middle and North Forks. The main stem is assigned Needs Verification until further fish surveys are conducted, and remains on the §303(d) List.

Stream temperature is §303(d) listed for East River. Temperature recording sensors show that for the main stem, and most of the Middle and North Fork reaches there are exceedances of the Standards temperature criteria for cutthroat spawning and incubation in July, and of the EPA bull trout criteria for July - September. However, judgement on criteria exceedances are to be delayed until negotiations with DEQ and EPA are finalized on temperature issues and Standards for Idaho streams (IDEQ 1999).

There has been no collection of bacteria samples to assess primary contact recreation beneficial use. Primary contact would default to Full Support based on the support status of cold water biota. Domestic water supply is an existing use of East River waters, but the use is isolated to single family residences so the turbidity criteria does not apply. The toxic substance criteria was Not Assessed.

3.3.B.8 Data Gaps

Instream measurements of pH and DO levels within East River need to be obtained, as well as collection of bacteria samples. An electro-fishing survey within the main stem is needed and will be conducted by DEQ in 2001.

3.3 §303(d) Listed Streams Evaluated as Impaired for Cold Water Biota Beneficial Use, and Recommended for Sediment TMDL Development

A. Lower West Branch Priest River

Summary
Lower West Branch Priest River was added to the 1996 §303(d) list as a result of Idaho Panhandle National Forest analysis. A pollutant of concern was not listed, but sediment became listed in the 1998 DEQ §303(d) List (IDEQ 1999), and Lower West Branch was retained on the 1998 List.

There were four BURP sites on the main stem of Lower West Branch, and all MBI scores gave Full Support to cold water biota beneficial use. However, based on the analysis of additional information required with WBAG+, the main stem appears to have impaired cold water biota, in part due to an excess of current sediment load. Main stem fish surveys by IDFG and DEQ show an absence of cutthroat trout, and brook trout densities, overall, exhibit a low density. Habitat measurements and observations indicate a high percent fines which have limited gravel and cobble aquatic insect habitat and salmonid spawning habitat. Instream cover and pool quality are often rated as poor. Also, the USFS rates the watershed system at 64% Not Properly Functioning and 36% Functioning at Risk, and attributes poor channel conditions in part to historic and ongoing sediment delivery to streams (USFS 1999).

Sediment load calculations presented in Section 4 and summarized in this section suggest that the current sediment load represents at least a moderate increase over background. Currently, there is an array of land use practices which are contributing sediment and these include: high density Forest Roads and stream crossings; an influx of substandard private roads and driveways; questionable maintenance procedures on County roads; documented departures from BMPs by Non-industrial Private Forest (NIPF) timber harvesting operations; and direct cattle access to streams on private property and Forest Service grazing allotments. There are ample opportunities for better BMP implementation to reduce the watershed sediment delivery to streams.

3.3.A.1 Physical and Biological Characteristics

Lower West Branch is a 4th order tributary on the west side of Lower Priest River (Figure 2-2), flowing southeast to the river. Main stem length is 25.3 miles. The watershed is complex and large, 56,835 acres (Table 2-2). There are numerous 1st order to 3rd order streams flowing into the main stem, and total length of watershed perennial streams is approximately 192 miles. For the IDL - CWE analysis that is presented in this section, the watershed was divided into eight 6th order HUCs as delineated with acreages shown in Figure 3-13a.

Most of the main stem flows through flat terrain, and tributaries to the west, north and east originate in hillslopes and mountains. Elevation ranges from 2,100 ft at the confluence with the river to 5,600 ft at South Baldy Mountain, creating the headwaters of the main stem. Most tributaries have mountain crests between 3,500 - 4,800 ft elevation. Average annual precipitation increases from 32 inches at the mouth to approximately 40 inches at high elevations. Precipitation is 25 - 50% snow with a snowmelt dominated runoff pattern. Peak flow is during mid-March through late April. A large area of gradual topography surrounding the main stem, ranging from 2,100 - 3,000 ft elevation does experience mid to late winter rain on snow events.

Higher elevation lands of the northern mountain range are residual granitic batholith; the western and southeastern mountain ridges are residual belt rock; and the valley hillslopes and stream bottom lands of the main stem are lacustrine deposits (Figure 4-2). Only the very lower main stem valley has been typed in the SCS general soil map, and this valley is Mission - Cabinet - Odenson soil group (Table 2-3).

Figure 3-13a. Lower West Branch Priest River Watershed: streams, BURP sites, and gradients.

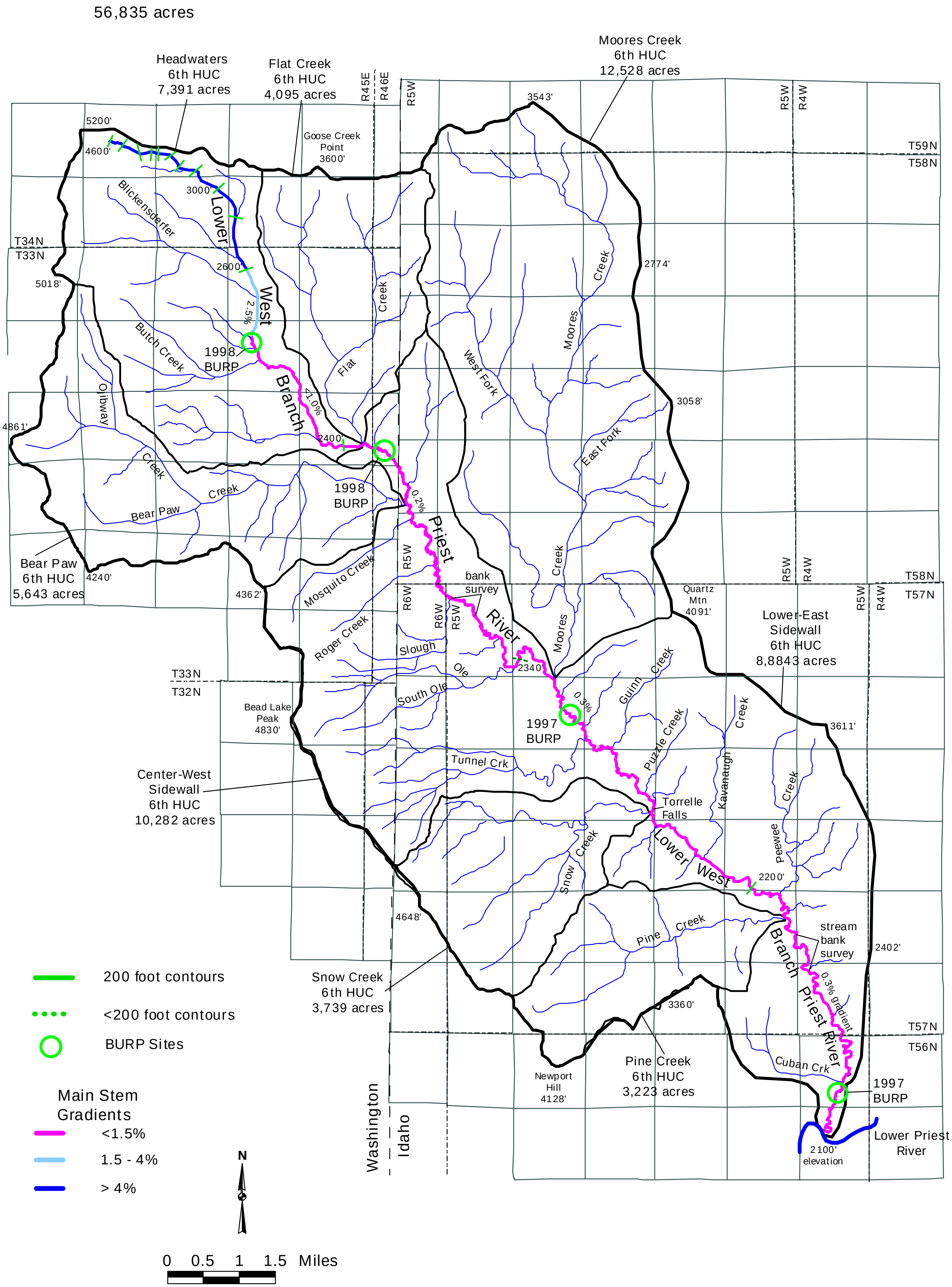
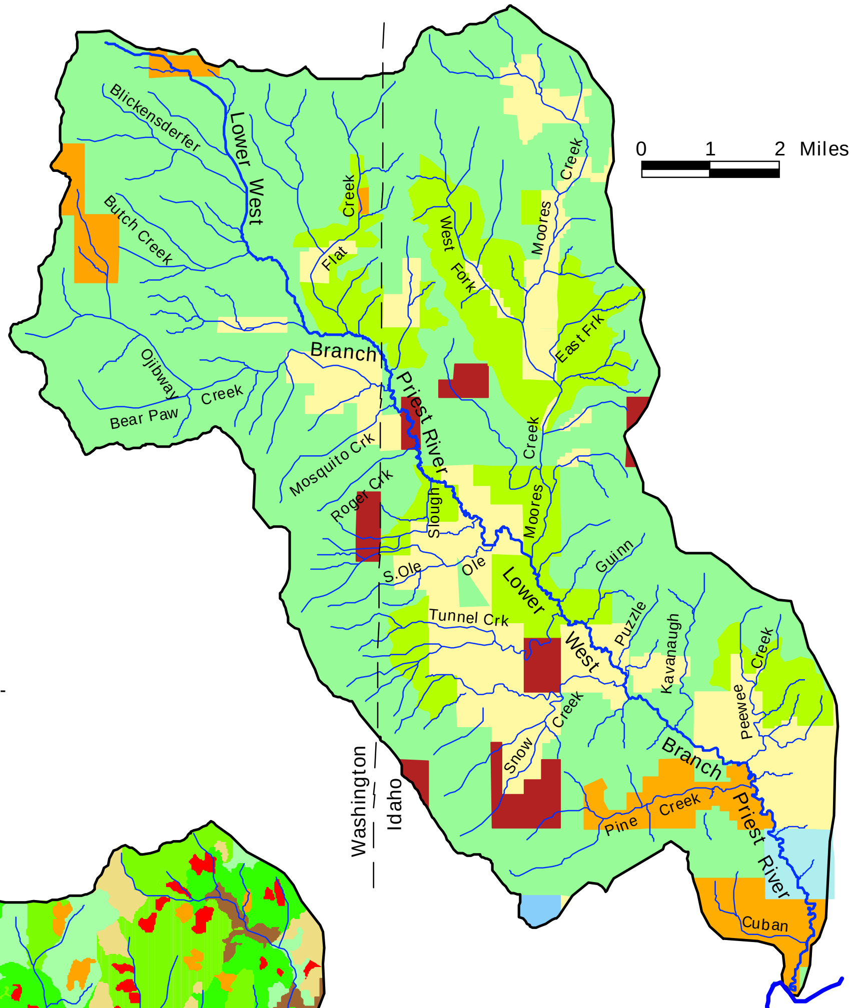


Figure 3-13b. General land use and ownership in the Lower West Branch watershed.



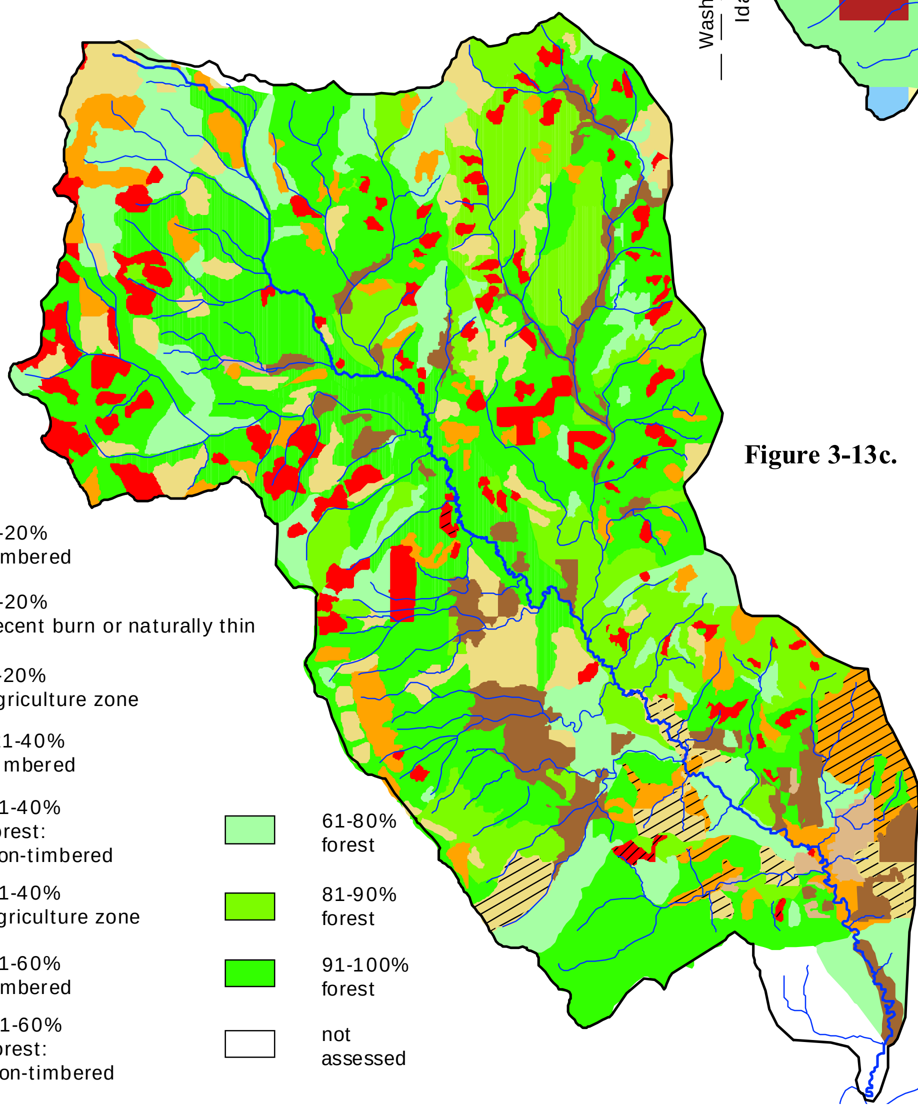
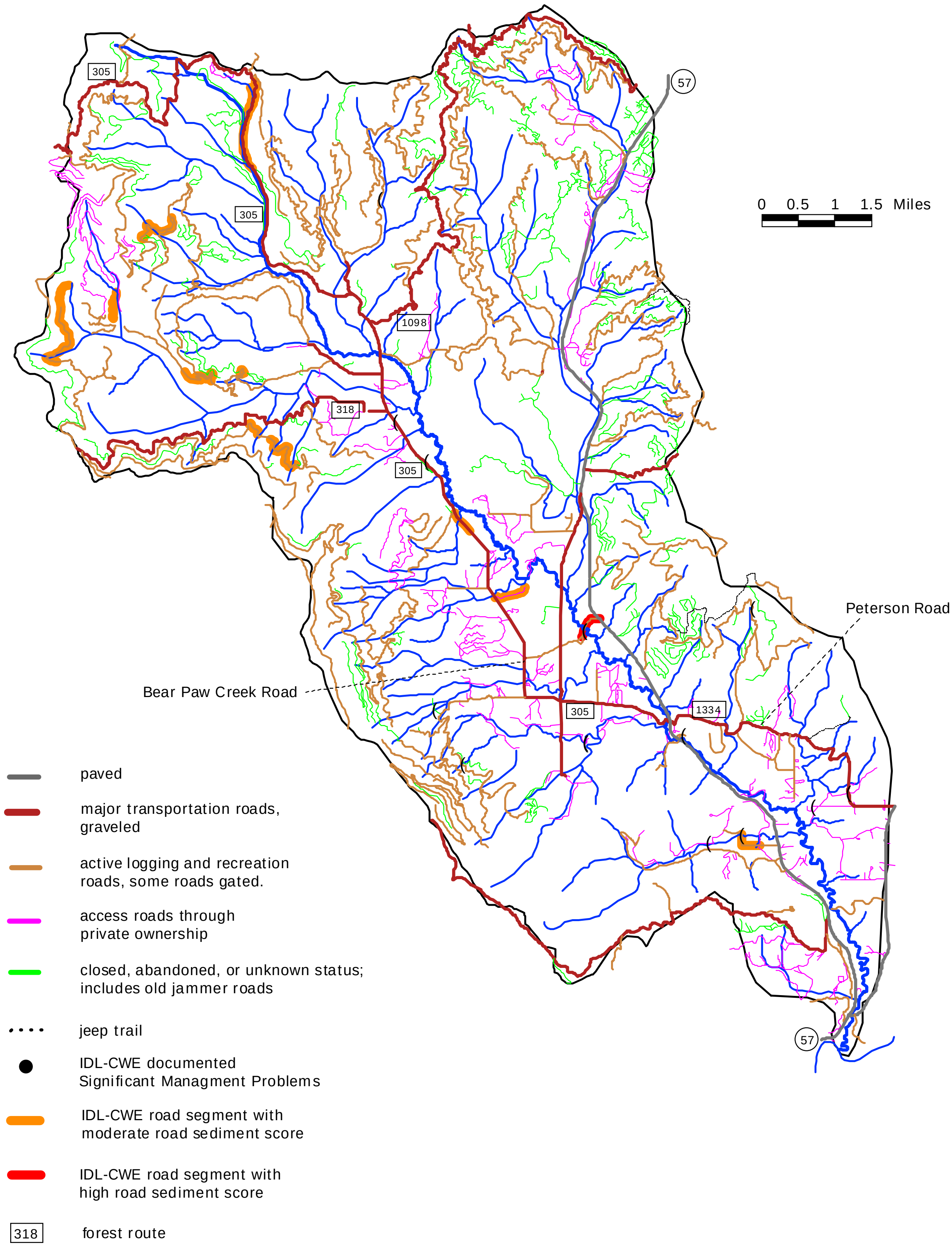


Figure 3-13c. Canopy cover of the Lower West Branch watershed.

Figure 3-13d. Roads in the Lower West Branch watershed.



Historic wildfires between the years 1900 - 1937 occurred within the southern one-fourth of the watershed (Figure 2-6, USFS 1999). The larger remaining portion of the watershed has received only scattered and isolated fires. There have been no large fires since 1950. Current conifer forest types are dominated by Douglas-fir, grand fir, and western red cedar (USFS 1999). The USFS estimates 3,330 acres of National Forest Lands in the watershed have some level of Douglas-fir beetle caused mortality. Harvesting of some of the affected trees began in 2000.

Around 85% of the main stem length is gradual sloped with a majority of the gradient less than 0.5% (Figure 3-13a). The predominant channel type is F4/F5 with confined banks (USFS 1998b), but there are long stretches of C and D channel types with broad floodplains. Riparian vegetation is a mix of alder/willow and sparse to dense conifer overstory. Along the stream course are many wetland areas. Most tributaries have a higher percentage of B and A Channel type than the main stem. The exception is Moores Creek, one of the larger tributaries, which is almost entirely gradual slope. Significant areas of flatlands surrounding Lower West Branch and lower sections of tributaries have been converted to hay cropping and grazing. Approximately 62 miles of the watershed perennial streams flow through private land, or around 32% of the total, and another 25 stream miles flow through federal land with allotments for grazing.

Substrate type throughout most of the main stem is a thick layer of sand and silt, with scattered gravel and cobble beds. Compared to other west side streams of the Priest Lake basin, there are considerable deposits of silt and clay related to the belt rock parent geology of the western and southeastern hillsides, and a lacustrine stream valley. Meander pools and glides/runs are the predominant habitat type (USFS 1998b). There are a few sections of riffles, shallow runs, and pool tailouts with gravel and cobble suitable for spawning. Beaver dams and pools are common. There are reaches with a good amount of woody debris of alder and conifers incorporated into the channels and forming pools. Pool quality has mostly been rated as poor to adequate, and instream cover is generally rated as poor.

In 1987 IDFG conducted an electro-fishing survey within the main stem from the mouth to the Idaho - Washington border, and within Moores Creek (Horner *et al* 1988). The USFS conducted snorkeling and electro-fishing surveys in several tributaries in 1992 and 1998 (USFS file notes). DEQ electro-fished two lower main stem sites in 2000. Historically, the Lower West Branch drainage was considered as supporting populations of westslope cutthroat trout. In the IDFG surveys no cutthroat were sampled. Fish species captured were brook trout, redside shiner, longnose dace, largescale sucker, pumpkinseed, brown bullhead and channel catfish (the latter two species are presumed migrants from Blue Lake). It is known from local fishermen that an occasional brown trout and rainbow trout is caught. Brook trout density was low in the Lower West Branch. Moores Creek on the other hand had high densities of brook trout and was considered to have good quality brook trout habitat.

The USFS surveys of tributaries showed mainly a dominance of brook trout with occasional cutthroat sampled. DEQ surveys found low brook trout density within the lower half of the main stem, and no cutthroats were captured.

It is uncertain if bull trout inhabited Lower West Branch historically, but they are probably not present now, and the stream is considered low priority in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a). A complete fish migration barrier exists on the main stem at Torrelle falls, 8.2 miles from the mouth. There also is a fish migration barrier about one mile from the mouth of Bear Paw Creek, a major tributary, due to twin culverts under Forest Service Road 305 (Figure 3-13d).

3.3.A.2 Cultural Characteristics

Lower West Branch is a mixture of federal lands and private ownership with a small acreage of State ownership (Table 2-5 and Figure 3-13b). Land use activities in this watershed is considered high relative to the rest of the basin. Industrial timber holdings total 1,468 acres in the watershed. Within the State of Idaho there are 9,978 private acres which are not industry owned. Most land use on these private holdings has been given a general designation of agriculture zone with hay cropping and grazing. Small scale NIPF timber operations occur on this private land, and there have been several observations of departures from Idaho Forest Practices Act (FPA) - BMPs. As more rural homesteads are being built there also has been an increase in substandard private roads and stream crossings. In the State of Washington there is another 1,919 acres of private non-industrial land where there is hay cropping, grazing, and NIPF timber operations. Land under USFS management totals 42,743 acres, around 32% in Washington. Most of this land is managed for timber production and there is a substantial 7,895 acres in grazing allotments.

The Lower West Branch has had a long history of logging beginning in the late 1890s (USFS 1999). A large timber sale occurred between 1912 and 1930, conducted by Dalkena Lumber Company, and mainly was selective logging of large and more valuable trees. There has been a succession of timber sales on federal lands since then. During early settlement days a good deal of the homesteaded land was logged with acreage converted for agriculture, which included drainage ditches and wetland conversion, and stream channel straightening. An estimated 25% of the drainage has been logged (Figure 3-13c). The watershed is moderate to heavily roaded.

3.3.A.3 Pollutant Source Inventory

Point Source Discharges
No point source discharges exist in the Lower West Branch watershed.

Nonpoint Sediment Sources

***Timber Harvesting* -** USFS cites that a portion of current poor stream habitat relates to the legacy of early and mid century harvesting (USFS 1998b). For example, in the late 1930s a major logging operation transported logs down the stream channel by cordoroys and flumes. An extensive road system was built throughout the drainage, adjacent to streams in some areas. Another example comes from USFS field notes that reported a damaging clear-cut operation in the upper stretches of Mosquito Creek watershed (USFS 1998b). The riparian zone had been harvested and no apparent buffer zone exists. The stream is choked with slash along the clear-cut borders, and silt has filled in the pools and covered the riffles. This timber sale was within legal guidelines at the time of harvesting (USFS 2000c).

***NIPF Timber Harvesting* -** Departures from forest practice BMPs have been observed by NIPF operations in the Lower West Branch watershed. In one case along the lower main stem, a clear-cut harvest was conducted on a steep bank of the stream, and shortly thereafter a rain storm caused a mud slide into the stream. Several NIPF operations have been observed along the flatlands of Bear Paw Creek Road, a major road that is county maintained. In a few cases the logging road approach to the county road was not armored, and produced sediment to the road ditches during rain storms. In turn, this sediment was delivered to streams crossing under the county road. In a couple of cases the initial logging road construction filled in the county road drainage ditch (no culvert), with the temporary blockage causing sediment runoff and road wash.

***Roads and Stream Crossings* -** DEQ GIS analysis of roads in the watershed produces a total of 472 miles (18.5 miles paved), for a moderate - high road density of 5.3 mi/mi^2 (Figure 3-13d, and this excludes roads obliterated by USFS). Density of active roads that are either open or have access controls is 4.0 mi/mi^2, well above the basin-wide average (Table 2-13). Of the 352 miles of active roads, 87 miles are unpaved access roads servicing private timber, agricultural, and rural residential areas.

Stream crossing density of the total road network equals 1.3 crossings/mile of stream (238 stream crossings), just above the basin-wide average. During IDL - CWE inventories in September 1999, several culverts were found to have down-stream drops (bottom lip of culvert to surface water) in excess of 1 foot and at times 2-3 feet. This degree of drop may prevent upstream fish migration. Also, a few culverts were found to be causing extensive down-stream bank cutting and erosion.

The IDL - CWE inventory covered 85 miles of forest roads that were recorded on the GPS unit (other miles were driven that were not recorded because of GPS malfunction). The weighted average road sediment score among the eight, 6th order HUCs assessed was 17, or "low". There were 14 Significant Management Problems recorded (Figure 3-13d), and these were road segments with severe erosion or structural failures.

The USFS also recorded road problems in the 1998 assessments for the Douglas-fir beetle EIS (USFS 1998b). On Flat Creek for example, two old logging roads run parallel to the stream and the road closest to Flat Creek had been washed out in two places, contributing sediment. In areas where the road bed is still intact, water has carved a channel down the middle of the road which eventually drains into the stream.

Based on the sediment load calculations for Lower West Branch in Section 4, the total road network is estimated to increase sediment load over the natural forested land yield by 79% (assuming 100% delivery to streams). This loading includes an estimate of road washout problems at stream crossings based on USFS maintenance experiences (Janecek Cobb *pers comm*).

Urbanization and Private Roads - Increasingly there seems to be development of 5-20 acre home lots and ranchettes in the watershed. Development was observed to the west along Bear Paw Creek Road (Forest Road 305, Figure 3-13d), to the east off Peterson Road (Forest Road 1334), and along Pine Creek. Several miles of private roads and driveways in these areas were assessed during the CWE inventory. In general, these unpaved roads do not meet the standards established by FPA roads. Often, there is no gravel base and there is rutting and channelization of flow. Drainage ditches are often inadequate and not stabilized, and there were occasions when loose dirt spoils of newly dug ditches were very close to streams and clearly eroding into the streams. Some culvert road crossings were observed as not having proper gravel armoring, and there were raw cut and fill banks at the crossings. Private roads and driveways built on steep slopes often do not have adequate runoff management structures such as water bars and dips, or cross drain culverts. Examples of subwatersheds where sediment producing private roads were observed include Pine Creek, Snow Creek, and Pee Wee Creek.

County Roads - Bear Paw Creek Road is a major transportation road maintained by Bonner County. Beginning at Hwy 57, the road runs west and then northwest following the general course of Lower West Branch (Figure 3-13d). The road eventually becomes Forest Road 305 which runs parallel to the headwaters of the main stem. There also is a major north - south cross road at the Four Corners Grange. The significance of this road system (about 10 miles), is that numerous tributaries cross perpendicular under the roads as they head toward the main stem. Tributaries crossing under this road system include Snow Creek, Tunnel Creek, Moores Creek, Ole Creek, Slough Creek, Roger Creek, Mosquito Creek, Bear Paw Creek, and the main stem itself.

The road does have a good gravel base, and is a flat-rolling grade until it parallels and heads up the main stem headwaters. But, from observations it is obvious that fine sediment does flow off the road into the drainage ditches, and then is deposited into streams at the road crossings. Possibly producing a greater amount of sediment is the ditch maintenance practices of Bonner County. Each fall the ditches are scraped clean and the spoils are piled on top of the ditches. This produces significant loose soil, and during fall rain storms the loose dirt sloughs and is incorporated into the ditch runoff reaching streams. The ditches are not given the opportunity to develop a vegetative base for soil stabilization. The county states that this practice is necessary to maintain sufficient carrying-capacity in the ditches to prevent overflow and road wash. The county has placed some straw bales and filter fencing at ditch terminals of stream crossings, but overall these are inadequately preventing sediment discharge to streams.

Encroaching and Riparian Roads - With the exception of stream crossings, only a minor amount of the Lower West Branch road network is within the 50 ft encroaching zone. The total road network within a 200 ft zone of watershed streams (including stream crossings), equals 49 miles, or 0.26 mi/mi of stream, and active roads in this zone is 0.20 mi/mi of stream. Based on the USFS draft Geographic Assessment for the basin (USFS 2000a), the estimated riparian road density for the Lower West Branch is 4.3 mi/mi^2 riparian area (Table 2-13). The above data for riparian roads is around the basin-wide average.

Mass Wasting - The IDL - CWE mass failure hazard rating for the eight, 6th order HUCs ranged from moderate to high, except for a low rating for Pine Creek. Only one mass failure was recorded in the CWE assessments, and the mass failure sediment delivery score for the watershed was "low". From USFS maintenance experiences however, there are, on the average, around 6 failures per year on the federal road prism other than stream crossing washouts (Janecek Cobb *pers comm*). Average soil volume delivered to streams per failure was estimated around 55 cubic yards. There are also atypical (averaging once every 10 years or so), large mass failures, such as a 1997 road-bed fill failure on Bear Paw Creek Road near the Ole Creek stream crossing. This failure delivered an estimated 2,220 cubic yards near the vicinity of the stream crossing. Including an estimate of the above two types of failures into sediment load calculations for the road prism, increases sediment load over the natural forested land yield by 156%.

There have also been large mass failures along Lower West Branch main stem within a lower reach canyon of about 5.5 stream miles. This canyon reach begins around the Cuban Creek inflow (T56N R5W S1), and continues upstream past the Pine Creek inflow terminating near the southwest corner of T57N R5W S23 (just past elevation 2200 ft on the main stem, Figure 3-13a). Here, the canyon walls are steep and about 200 feet high, and apparently susceptible to failure because of the high sediment hazard landtype Lacustrine Stream Channels. A layer of gravelly silt or sandy loam overlays a clay layer, allowing slippage (Niehoff *pers comm*). During the stream bank erosion survey in 2000, a 1.0 mile reach was assessed within this area. Four mass failure scars were observed, at least one in recent times since a barbed wire cattle fence and steel fence post were hanging in the air at one failure scar. This failure was estimated at 200 ft wide, 200 ft long, an average 7 ft deep, and with 100% delivery to the stream the volume was around 10,370 cubic yards and 22,000 tons. It is uncertain as to what degree these failures are natural as compared to relating to land use activity. One failure in this stretch has been attributed to a private clear-cut followed by a landslide during a thunderstorm. Also, a sediment deposition plug or debris dam, along with peak high flows, may concentrate stream energy toward the toe of a cliff segment, precipitating a mass failure (Janecek Cobb *pers comm*).

Agriculture - Related to the agricultural acreage and federal grazing allotments, there has been some stream bank damage done by direct cattle access and crossings, as documented by USFS surveys (USFS 1992 and 1998b), and by DEQ observations. Stream reaches exist where there is little in the way of riparian shrubs offering shading vegetation, and banks are sloughing. Stream segments affected by grazing include Snow Creek, Tunnel Creek, Bear Paw Creek, Moores Creek, Flat Creek, and isolated sections of the main stem. There are historic wetlands, wet meadows, and floodplains that have drainage ditches and stream channels that have been straightened.

Canopy Cover and Peak Flows - Unfortunately there have been no documented stream flow measurements and gauging efforts to form a daily hydrograph on Lower West Branch. IDL - CWE assessments were able to compose a canopy cover map (Figure 3-13c), although there were several zones of estimation due to an incomplete set of available aerial photographs and orthophoto quads. Canopy Removal Indexes (on forested lands only) for the eight, 6th order HUCs ranged from 0.10 to 0.40, with a weighted average watershed CRI of 0.27. The Channel Stability Indexes all ranged on the high end of moderate (trending toward an unstable condition), 51 - 56 CSI. The overall watershed Hydrologic Risk Rating was within mid-point of the moderate range. USFS estimates that 16% of the watershed has hydrologic openings (USFS 2000a).

USFS cites that, "the Lower West Branch is a channel out of hydrologic equilibrium as evidenced by extremely poor channel conditions and numerous sources of ongoing sediment delivery to streams" (USFS 1999).

Instream Erosion - It is believed that stream bank erosion is a significant direct sediment contributor to the main stem and tributaries. There are many reaches along the main stem of C and F channel types with one or two confining banks that are at times high and steep. Areas have been documented where super saturated clay banks are eroding and sloughing. At times this is a natural condition related to insufficient root stabilizing vegetation. But there are observations where the condition has been obviously exacerbated by historic riparian logging, adjacent road fills, cattle access, and 4x4 access. Within the bankfull width, there is documentation of high amounts of down cutting, bank slumping and undercutting (USFS 1998b). This condition can be exacerbated by excess stream energy related to hydrologic openings and decreased floodplain function. USFS field surveys estimate that in some reaches as high as 50 - 75% of the stream banks were affected by bank slumping (USFS 1998b).

As mentioned previously, a stream bank survey was conducted along 1.0 mile of the lower main stem within a canyon. Portions of this reach likely had historic cattle access, but there was little sign of recent access. Of the total stream reach assessed, 24% of the length was found to have either one stream bank or both with evidence of a recent eroded condition. A statistical work-up of the survey data leading to an estimate of lateral recession (data analysis by the NRCS, Sampson *pers comm*), produced a moderate - high erosion rate of 51 tons/stream mile/yr for the one mile assessed.

A middle reach on the main stem, from the confluence of Slough Creek and downstream (Figure 3-13a), was also surveyed for bank erosion. Stream length assessed was 0.5 miles. This reach was within a federal grazing allotment and private agricultural land where there is current cattle access to the stream. Of the total stream reach assessed, 18% of the length was found to have either one stream bank or both with evidence of a recent eroded condition. The calculated erosion rate was 33 tons/stream mile/yr over the 0.5 miles assessed.

When extrapolating the calculated instream bank erosion rates from the two segments assessed over 21.3 miles of gradual gradient main stem, the load becomes 851 tons/yr.

3.3.A.4 Summary of Past and Present Pollution Control Efforts

See Section 2.4.2, page 60 for Forest Plan of the Idaho Panhandle National Forests. In their comment package to the draft SBA, USFS states that as a result of the Douglas-fir beetle EIS the agency identified improvements to include road obliterations, improved road surfacing, improved culvert sizing, and increased frequency of cross drains (USFS 2000b). Through timber sale receipts obtained from the Douglas-fir beetle project, USFS has scheduled restoration activities within the Lower West Branch drainage including: 12 miles of timber road obliteration; 22 miles of road reconstruction; maintenance procedures over 34 miles of road; an addition of 39 relief culverts and 132 rolling dips; and removal of 24 instream culverts (USFS 2001).

3.3.A.5 Water Quality Concerns & Status

Refer to Table A-5 for the history of DEQ §305(b) and §303(d) listings for Lower West Branch; Table 2-6 for designated and beneficial uses; and Table 2-12 for determined support status of designated and existing beneficial uses.

3.3.A.6 Summary and Analysis of Existing WQ Data

A daily hydrograph has never been established for Lower West Branch, and the only flow measurements on record are from the summer BURP crews. USFS does estimate a mean annual discharge of 178 cfs.

Peak flow would be from mid-March to late April. From visual observations this stream is very flashy as stream flow responds quickly to winter and early spring rain-on-snow events. USFS, though, labels the acreage of sensitive snowpack at 30% of the drainage, a percentage less than most other western watersheds (USFS 2000a). Summer base flow in the lower main stem measures from 20 - 35 cfs. Based solely on a watershed proportion basis applied to the annual gain in water in Lower Priest River between the upper and lower USGS gauging stations (Figure 2-1), annual flow into the river from Lower West Branch would average 80,140 ac-ft.

Only a very few water samples have been taken in Lower West Branch. Visually, the lower half of the stream runs extremely turbid during spring runoff. In one DEQ sampling (late spring 1998), seven sites along the main stem were sampled for turbidity and suspended sediment. At the two lowest downstream sites, turbidity reached 36 NTU and maximum TSS was 48 mg/L. If sampling were to occur during the spring rising limb of the hydrograph, it is estimated that turbidity and TSS values would be substantially higher than these values.

There have been no recorded measurements of pH and DO. DEQ placed a temperature sensor within the lower main stem, downstream of Torrelle falls, from June 24 - October 2, 2000. During the warmest period of early July to mid August mean daily temperatures ranged from 15.0 - 16.8°C, and daily maximum temperatures ranged from 15 - 19.0°C (Figure 3-14). The IDL – CWE, stream canopy closure assessments, rates the main stem from mouth to beginning of headwaters as 5 - 20% canopy cover, or high salmonid temperature rating (adverse condition).

Only one bacteria sample has been taken, in September 1999. The count was 100 FC colonies/100 ml, and 130 *E. coli*/100 ml.

The BURP MBI scores for the four Lower West Branch sites (Figure 3-13a), are:

Lower 1997 = 3.7 Mid-Lower 1997 = 4.3 Mid-Upper 1998 = 4.0 Upper 1998 = 3.6

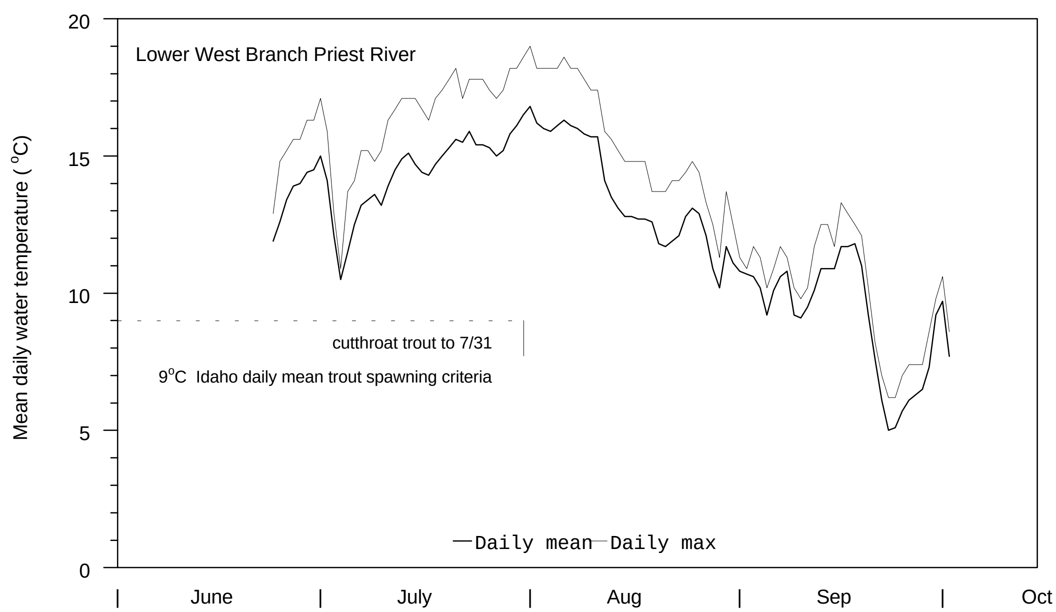


Figure 3-14. Mean daily and daily maximum water temperatures from June 24 - October 2, 2000 within a lower segment of Lower West Branch Priest River.

Table 3-7. Summary of Salmonid Fish Surveys in Lower West Branch and Tributaries, and Adjacent Streams

Study	Stream	Brook trout	Cutthroat
IDFG 1987 electro-fishing	Lower West Branch - mouth to ID-WA line 7 reaches sampled	range = 0.0 - 5.4/100 m^2 mean = 1.8/100 m^2	0
	Moores Creek 3 reaches sampled	range = 2.1 - 29.9/100 m^2 mean = 19.3/100 m^2	0
	Quartz Creek[a] 3 reaches sampled	range = 4.3 - 56.8/100 m^2 mean = 28.0/100 m^2	present in 1 reach, 1.5/100 m^2
	Upper West Branch 3 reaches sampled[a]	range = 0.7 - 3.3/100 m^2 mean = 2.0/100 m^2	0
USFS & Washington Dept. Of Wildlife 1992 electro-fishing	Hickman Creek	2 fish	none captured
	Butch Creek	numerous brook trout	none captured
	Mosquito Creek	present	present in headwaters
	Lower West Branch	1 fish	none captured
USFS 1998 & 1999 snorkeling and electro-fishing	Bear Paw Creek 3 reaches sampled	3, 6, and 23 fish sampled in 3 reaches	15, 4, and 0 fish sampled in 3 reaches
	Ojibway Creek 4 reaches sampled	2, 4, 13, and 7 fish sampled in 4 reaches. Est. mean density= 4.7/100 m^2	0, 0, 1, and 3 fish sampled in 4 reaches. Est. mean density= 0.5/100 m^2
	Moores Creek 1 reach	177 fish, est. density= 44/100 m^2	none captured
	Kavanaugh Creek	3 fish	2 fish
DEQ 2000 electro-fishing	1997 Lower BURP Site	0.3/100 m^2	0
	1997 Mid-Lower BURP Site	1.1/100 m^2	0

a = Quartz Creek is an adjacent stream to the east; Upper West Branch is an adjacent stream to the north.

Table 3-7 summarizes electro-fishing results from 1987 IDFG surveys (Horner *et al* 1988); narrative notes from 1992 and 1998 USFS snorkeling and electro-fishing (USFS file notes); and DEQ electro-fishing in 2000 at the lower and mid-lower 1997 BURP sites. The USFS surveys were intended for presence/absence indications, and the data is mostly total fish captured without estimates of density.

IDFG surveys showed overall, low density of brook trout in the main stem, although 2 of the 7 reaches surveyed did have moderate densities of around 5 fish/100 m^2. No cutthroat trout were captured. Low salmonid productivity was in part attributed to a pool quality that rated poor - fair, lack of instream cover, and sparse habitat for spawning and aquatic insects (Horner *et al*. 1988). The absence of brown trout in main stem sampling indicated limited success of a 1976 introduction of this species in the Lower Priest

River. Sampling in Upper West Branch immediately to the north, which is almost the same dimension and flow, also had low densities of brook trout. The tributary Moores Creek showed high density of brook trout, as well as Quartz Creek, another small stream immediately to the east.

USFS surveys show the presence of cutthroat trout in some of the tributaries, mostly at low numbers except for decent numbers in Bear Paw Creek. DEQ sampling within the lower main stem site showed very low density of brook trout, and no cutthroat captured. Northern pikeminnow and redside shiner were abundant. Eleven brook trout were captured at the lower-middle BURP site (2 age classes including juveniles), but density calculated as low. Numerous sculpin were sampled at the mid-lower site.

The BURP HI scores for the four Lower West Branch sites are:

Lower 1997 = 65 Mid-Lower 1997 = 68 Mid-Upper 1998 = 48 Upper 1998 = 83

The first 3 scores are some of the lowest recorded in the basin, and the score at the mid-upper site falls within the Not Full Support category. Habitat parameters that had below mid-point scores were common among all sites, and included: 40 - 100% fines, poor instream cover, high embeddedness, slow/fast ratios from 0 - 0.2, and lack of habitat type diversity. The low slow/fast ratios resulted from most of the BURP reach lengths being classified as a "run". This habitat typing is contrary to that estimated from USFS habitat surveys where pool/riffle ratios as high as 44:1 were cited (USFS 1992). The difficulty in Lower West Branch is a deep depth and uniformity of channel dimensions, so it is often a subjective interpretation to distinguish between a pool, run or glide. Regardless, recognizable riffles are rare; in the first 3 BURP sites there were no habitats typed as riffles.

The 1992 DEQ Use Attainability survey of 2 sites within the lower to middle main stem gives a similar picture of marginal habitat conditions. Overall habitat score for both sites rated as "poor", with low scores relating to lack of instream cover, sand deposition, and embeddedness. Pool complexity was rated as poor. At one site most of the 480 m reach was classified as a glide with only 1 pool. At the other site a single large pool yielded a moderate Residual Pool Volume of 351 m^3/km.

USFS field surveys within reaches of federal ownership were conducted in 1998 on Lower West Branch and the tributaries Flat Creek, Roger Creek, Mosquito Creek, and Moores Creek (USFS 1998b). Surveys included notes on habitat type, substrate type, instream cover, stream bank condition, channel type, and also Wolman Pebble Counts in low gradient riffles, pool tail-outs, and within pools.

USFS main stem surveys ranged from the confluence of Guinn Creek upstream to the headwaters near Blickensderfer Creek (Figure 3-13a). Several segments were omitted due to private property access. Percent fines (0 - 8 mm) within riffles and pool tail-outs averaged a high 64%. Fines included a clay and silt component. Percent fines were high within many pools. Many stream banks were found to be eroding with poor bank stability, and in some cases this was attributed to adjacent land use practices. Most pools were meander formed, but there were areas where most pools were formed by woody debris. In some reaches, high concentrations of woody debris embedded in the stream banks were attributed to past riparian logging operations.

Average percent fines in Flat Creek was 85%. Bank alterations caused by cattle were found in some sections, and some sediment was entering the stream from old logging roads. In Roger Creek, entirely B and A channel type, average percent fines was lower at 33%. Pool density and quality were rated overall as low within the two reaches surveyed. Percent fines were not measured in Mosquito Creek. Pool quality and density were rate overall as low. Mosquito Creek was considered impacted due to historic logging within a portion of the riparian zone.

Moores Creek runs primarily through flatlands of wet meadows, hay fields, and areas with direct cattle access from both private lands and federal grazing allotments (Figure 3-13b). Some sections through private property have been channelized. Moores Creek is of interest because of high density brook trout, and what USFS considers as good brook trout habitat (USFS 1992). Riparian vegetation is mostly shrubs and grasses. Instream cover is aided by aquatic vegetation. The lower-most 1 mile did have 41% pool habitat formed by meander, alder debris, and beaver dams, with pool quality rated fair to good. Riffles comprised 17% of the habitat. However, the next 1.4 mile reach, up to the confluence with West Moores Creek, has stream banks impacted by cattle grazing, and a habitat of 86% run, 10% pool, and only 3% riffle, and overall low quality due to poor instream cover.

3.3.A.7 Status of Beneficial Uses

The BURP MBI results for the main stem are all Full Support for cold water biota beneficial use. The IDFG fish sampling indicates Full Support for salmonid spawning beneficial use using brook trout as the species present, and USFS data shows limited cutthroat spawning in the tributaries. The DEQ fish surveys, when using WBAG guidelines (IDEQ 1999), results in Not Full Support for salmonid spawning for the lower main stem site, and also NFS for the mid-lower site with the combination of only 2 age classes and HI <73. There is little doubt however that there are self-propagating populations of brook trout throughout the main stem.

When examining cold water biota beneficial use by WBAG+, using additional information of fish survey results, habitat evaluations, and various sediment load calculations from land use data, the conclusion is drawn that for Lower West Branch, cold water biota beneficial use is impaired in part due to excess sediment. Within the main stem, run, riffle and pool tail-out habitat with gravels and cobbles are sparse, and IDFG cites low overall abundance of aquatic insects as a possible reason for the low productivity of brook trout (Horner *et al* 1988). Sparse habitat to support aquatic insects is also noted in USFS field notes (USFS 1998b). The various stream habitat surveys all show significant stream reaches of impaired fish spawning and rearing conditions related to sedimentation.

The judgment of Not Full Support seems in line with a summary of Lower West Branch conditions cited by USFS, that “the main stem of the Lower West Branch has been adversely impacted by frequent introductions of large volumes of bedload, historic ditching of channels, past filling of wetlands, and the altering of natural drainage patterns with road construction. The Lower West Branch is a channel out of hydrologic equilibrium as evidenced by extremely poor channel conditions and numerous point sources of ongoing sediment delivery to the streams. The channel will not likely move towards stability until large scale rehabilitation projects are implemented” (USFS 1999).

Stream temperatures show that there are exceedances of the State Standards criteria for cutthroat trout spawning and incubation in late June and July.

The fecal coliform and *E. coli* bacteria sample was below criteria levels, so FS is assigned to primary contact recreation. Domestic water supply is an existing use of some tributaries to Lower West Branch, and possibly of the main stem itself, but the use is isolated to single family residences so the turbidity criteria does not apply. The toxic substance criteria was Not Assessed.

3.3.A.8 Data Gaps

Turbidity/TSS sample runs should be made during the spring rising limb of the hydrograph to document the extent of suspended material.

3.3 §303(d) Listed Streams Evaluated as Impaired for Cold Water Biota Beneficial Use, and Recommended for Sediment TMDL Development

B. Kalispell Creek

Summary

Kalispell Creek was added to the 1996 §303(d) list as a result of Idaho Panhandle National Forest analysis. The listed pollutant is sediment. Kalispell Creek was retained on the 1998 §303(d) List (DEQ 1999).

Kalispell Creek has been assessed by 5 BURP sites. MBI results at a lower and middle site in 1995 resulted in Needs Verification for cold water biota beneficial use. MBI results at nearby lower and middle sites in 1997 produced Full Support, and an upper site in 1998 was FS. There have been numerous fish surveys throughout the Kalispell drainage in the last eight years, and while there are resident populations of cutthroat trout primarily in headwater reaches, densities are low, and very few cutthroats have been captured within the main stem. Brook trout are the dominant salmonid species, but even their population numbers appear low in relation to other comparable streams. BURP, DEQ Use Attainability, and USFS stream surveys show mostly poor to medium habitat values. Also, USFS rates the watershed system overall as a Not Properly Functioning Condition (USFS 1999).

The conclusion of this SBA is that the fish sampling data suggests an impaired salmonid fishery, or Not Full Support of the cold water biota beneficial use. USFS attributes an impaired fishery, in part, to a stream bedload of sand that exceeds the stream's capacity to transport it, with a result of filling in of pools and covering of spawning gravels, and also other habitat features such as sparse instream cover and insufficient recruitment of large woody debris which form pools (USFS 2000c). There is also the factor of significantly suppressed adfluvial cutthroat populations within Priest Lake that historically spawned in Kalispell Creek, and the competition factor of the introduced brook trout over the native cutthroat.

In the USFS comment package to the draft Subbasin Assessment (July 2000), USFS stated that there has been extensive surveys of the streams, road networks and timbered units, and with a few exceptions, identified sediment sources have been addressed (USFS 2000b). The DEQ sediment calculations presented in Section 4 and summarized in this section seem to show that the current sediment load from the road network is relatively low. One road impact is Forest Road 308 which for about 4 miles parallels closely Kalispell Creek within its floodplain. A large scale proposed project, detailed in an upcoming Kalispell timber regeneration/watershed restoration draft EIS, includes a plan to relocate this road to higher ground and restore riparian characteristics along this channel stretch (USFS 2000b).

The conclusion of the USFS watershed assessment is that the current habitat conditions seem largely a reflection of historic fire and legacy land use rather than recent sediment loading, and to some degree a reflection of the predominant granitic geology. Large stand replacing fires in the late 1800s and early to mid 1900s, intermixed with salvage logging and green timber logging, with related construction of a transportation network, clearly led to a historically high sediment delivery and water yield.

The draft SBA and TMDL (December 2000), agreed with the USFS in that the current level of watershed sediment load to Kalispell Creek has not likely impaired cold water biota beneficial use below Full Support, or prohibits recovery to Full Support. Kalispell Creek was thus proposed for §303(d) de-listing with sediment as the listed pollutant of concern. However, the Priest Lake Watershed Advisory Group (WAG) in their consideration of the draft SBA and TMDL, recommended that the current status call of Not Full Support for cold water biota warrants that Kalispell Creek not be de-listed, and that a sediment TMDL be prepared. This is the same conclusion and recommendation stated in the EPA comment package (EPA 2001). This final SBA and TMDL adopts the recommendation of the WAG and EPA and presents a TMDL for Kalispell Creek in Section 4.

3.3.B.1 Physical and Biological Characteristics

Kalispell Creek is a 4th order tributary on the west side of Priest Lake (Figure 2-2), flowing east from the headwaters and then southeast to the lake. Main stem length is 14.6 miles and watershed size is 25,210 acres (Table 2-2). There are approximately 64 miles of perennial streams.

For descriptive purposes the watershed is divided into 3 sections. East of Highway 57 the low gradient channel meanders 4.4 miles south then southeast to the lake (Figure 3-15a). This lower stream course has floodplains with riparian vegetation a mixture of alders, other shrubs, and sometimes a dense conifer overstory. Mountains to the north create tributary streams to Kalispell Creek, including Hazard Creek. Elevation reaches 4,057 at Lakeview Mountain.

The middle main stem section is between the confluence of Hungry Creek downstream to Hwy 57. Kalispell Creek in this segment is mostly low gradient C channel, but there are two lengthy B channel sections, 1.5 - 3.5% gradient. Mountains to the south produce several perennial tributaries (Pable, Rapids, Virgin, and Bath Creeks), and Nuisance Creek flows from the north. Elevation reaches 5,476 at Gleason Mountain. From a sediment management standpoint for Kalispell Creek, the subwatershed section to the north needs to be considered. The mountains and streams in the surrounding area of Diamond Creek, north of Nuisance Creek (Figure 3-15a), are mostly disconnected (surface water) from Kalispell Creek's main stem. They either go subsurface or flow into the Potholes Research Natural Area. There are two small streams flowing from the Potholes wetlands to Kalispell Creek, but it is believed that the majority of surface runoff and sediment produced from this northern subwatershed is not delivered to Kalispell Creek. An approximate dividing line (Figure 3-15b) gives an upper subwatershed size of 5,366 acres, and the size of the Kalispell Creek drainage reduces to 19,844 acres.

The third watershed section is the headwaters of Kalispell Creek, with 2.5 miles of B and A channel, and tributaries flowing in from the western mountains (Mush, Hungry, Chute and Deerhorn Creeks). Elevation reaches 5,552 ft at Hungry Mountain.

Average annual precipitation increases from 32 inches at the mouth to approximately 40 inches at high elevations. Precipitation is about 25 - 50% snow with a snowmelt dominated runoff pattern. Peak flow is during the period of mid-March through early May (Figure 3-16). Rain-on-snow events in mid to late winter produce only minor hydrograph spikes.

Higher elevation lands surrounding the watershed are granitic batholith, and valley hillslopes and stream bottom lands are glacial outwash, till and alluvial deposits (Figure 2-4 and Figure 4-2). There are some areas of belt rock along the northern slopes. The upper half of the drainage was glaciated, the lower half was unglaciated (USFS 1998a). The general soil map of west side Priest Lake basin only extends to the Idaho - Washington line (Figure 2-5). Lower bottom lands are Bonner soil, and granitic mountainsides are Hun - Jeru soils (Table 2-3). Valley terraces and hillslopes of glacial till are likely Priestlake-Treble soils. The IDL - CWE rating of overall surface erosion hazard is high, and the mass failure hazard rating is moderate.

The lower-most reach of Kalispell Creek east of Hwy 57 is described by the USFS as primarily C channel type with habitat composed of pools, runs and glides (USFS 1998c). The overall habitat quality is considered low - marginal because of the lack of adequate cover, habitat complexity, and depth to support large numbers of fish. Major sections have thick sandy bottoms. Alder/shrub bottoms are a very common riparian type, along with associated beaver influenced areas. There are some sections of conifer forest immediately adjacent to the stream. Recruitment of large woody debris is low, in part because of historic fire and timber removal. There are sections of riffles, glides and pool tailouts with gravel and cobble suitable for spawning, but percent fines and cobble embeddedness is high. West of Hwy 57 there are

Figure 3-15a. Kalispell Creek Watershed: streams, BURP sites, and gradients.

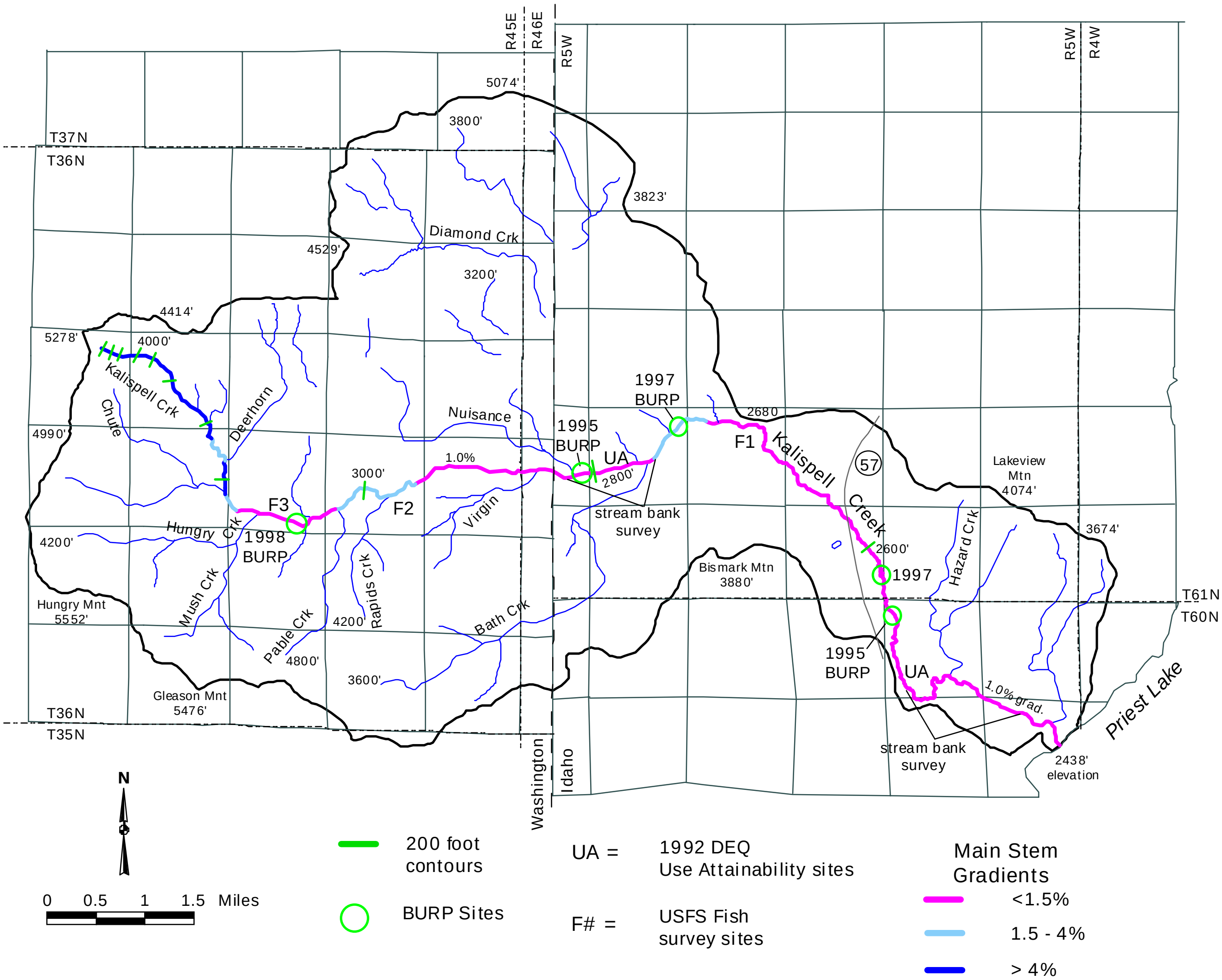


Figure 3-15b. General land use and ownership in the Kalispell Creek watershed.

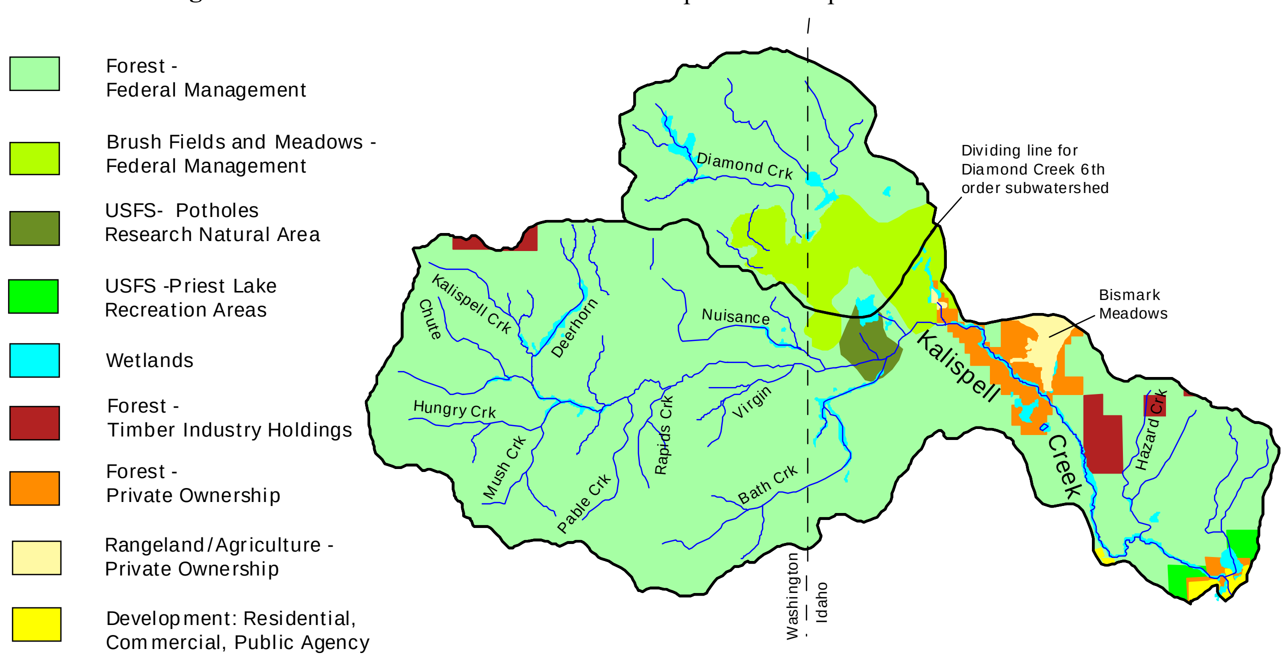
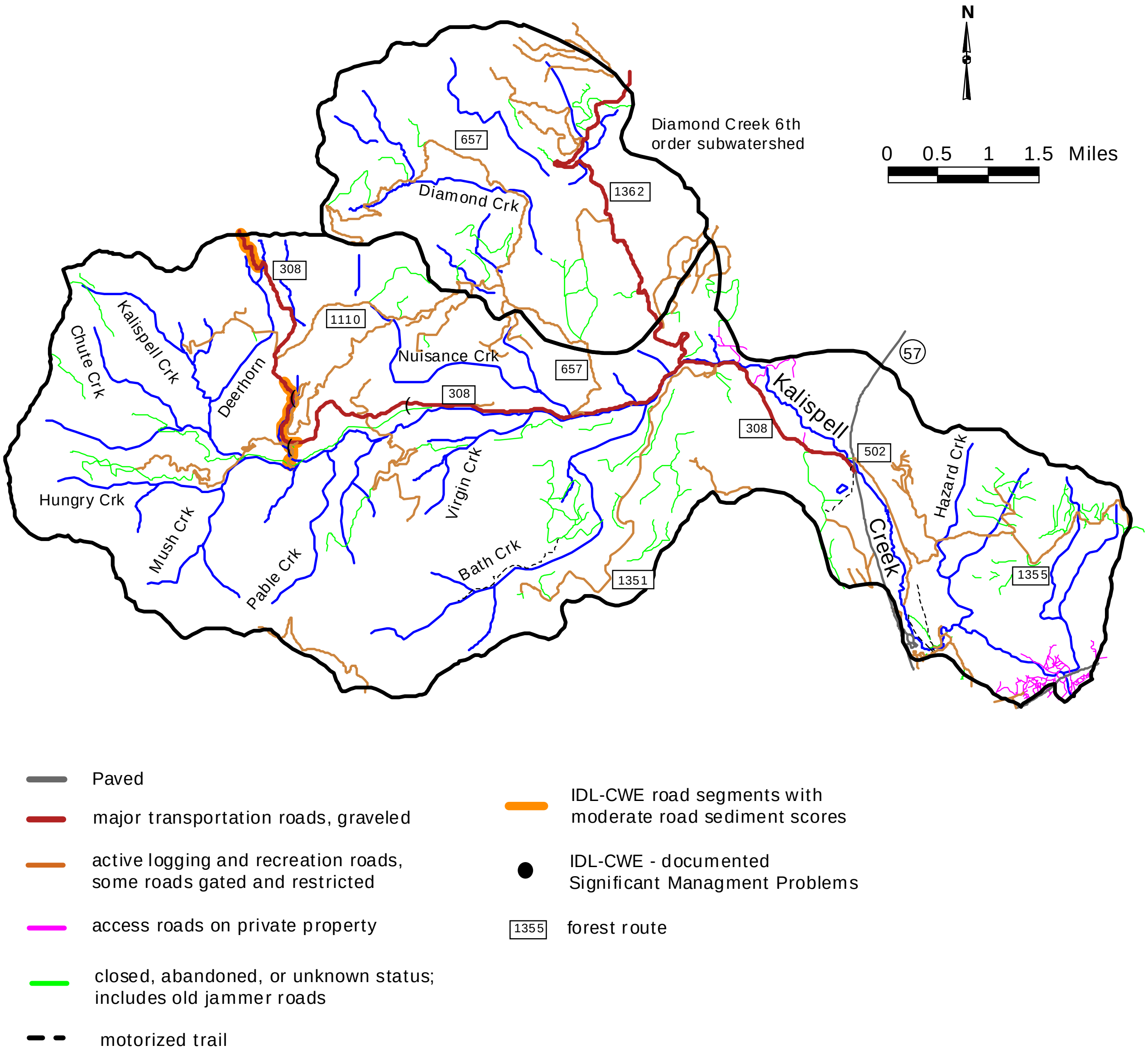


Figure 3-15c. Roads in the Kalispell Creek watershed.



major reaches that meet the above general description, but there are also B channels with decent pool quality and dense hemlock and cedar overstory. Beaver dams and pools are common throughout the stream.

Overall, the headwaters of Kalispell Creek and tributaries to the main stem offer better rearing and spawning habitat, in part because of a higher percentage of B channel type with fewer sand depositional zones, a greater percentage of pools formed by large woody debris, and more abundant gravels and cobbles (USFS 1998c). Still, much of this spawning habitat was found to be highly embedded (USFS 1998c).

There has been a history of large stand replacing fires in the Kalispell drainage over the past 100 years or so. An 1890 fire burnt the western and northern mountains, as well as the eastern lands near the lake (Figure 2-6). Another major fire occurred in 1926, and then a subsequent reburn in 1939. Following the fires and salvage logging, a large area of approximately 9,000 acres was planted with ponderosa pine and white pine, with also some Douglas-fir and spruce. The ponderosa pine seedlings were from a seed source not suited to the area, and the white pine seedlings were not from blister rust-resistant stock. These plantations have suffered high mortality due to insects and diseases, and the USFS is proposing a major timber rehabilitation/watershed restoration project in the drainage (USFS 1998c).

Several electro-fishing efforts by USFS have been conducted in Kalispell Creek since 1990, along with DEQ electro-fishing in 2000. In upper reaches of the main stem and within tributaries, there are brook trout, cutthroat trout, and sculpin, with brook trout dominating the numbers. In mid to lower reaches of the main stem only brook trout and sculpin were sampled by USFS, but DEQ electro-fishing did capture two cutthroats in a middle main stem reach. Historically, cutthroat trout displayed two life histories in the Kalispell drainage, adfluvial below fish barriers, and resident above barriers (USFS 1998c). Bull trout once inhabited Kalispell Creek, but the last reported observation of a bull trout was in 1984 (USFS 1998c). In the Priest Lake Bull Trout Assessment, Kalispell Creek is considered as supporting sub-adult and adult rearing and is considered of high importance to bull trout (Panhandle Basin Bull Trout TAT 1998a).

In a 1956 Priest Lake basin fish survey (Bjornn 1957), a significant proportion of the stream beds west of Hwy 57 were reported to have high amounts of sand covering the spawning beds, and this was in part attributed to the 1926 and 1939 fires. The 3 mile reach beginning at the mouth was found to have several sections of suitable gravel and cobble beds to support spawning, and numerous small cutthroat trout (up to 9 inches) were found in this stretch, as well as a few adfluvial spawners. A few bull trout were also reported.

At the public meeting for the draft SBA and TMDL (January 31, 2001), a long-time resident of the Kalispell Creek area gave an account of IDFG Rotenone treatments conducted in the 1950s and 1960s. This would have been done to eliminate brook trout. According to IDFG file memorandums, a Rotenone treatment within the main stem was conducted in August 1960, and IDFG subsequently planted 135,000 cutthroat fry (Fredericks *pers comm*). Another citizen's account was given of USFS chemical treatments on vegetation (Silvisar) along stream courses in the 1970s. There was speculation that the chemical might have leeched into streams leading to fish toxicity. These public comments were given as factors that might partially relate to the current low salmonid densities within Kalispell Creek.

3.3.B.2 Cultural Characteristics

Kalispell Creek watershed is a mixture of federal lands and private ownership (Figure 3-15b). Private lands total 1,360 acres (5.3% of the watershed), and private land uses include: residential areas surrounding the mouth, and increasingly, home lots developed along the stream corridor west of Hwy 57; Non-industrial Private Forest timber harvesting which includes conversion of forested land to commercial and residential properties; and a 200 acre agriculture zone within Bismark Meadows for primarily hay cropping, but also a minor amount of cattle grazing. Private timber industry owns 370 acres total, the biggest block located west of Hazard Creek.

USFS manages 23,850 acres and much of this land is managed for timber production. But federal land also includes: non-forested brush fields and wet meadows; the Potholes Research Natural Area; a portion of the Priest Lake Recreation SMA near the mouth; and a Grizzly Bear Management Unit.

The Kalispell Creek watershed has had a significant disturbance history over the past 100 years. Besides the multiple major fires from 1890 - 1939, there was major salvage and green timber logging. Railroad lines were constructed up the main stem and its many tributaries, and chutes were built to transport logs down the stream. Large stretches of riparian area were encroached upon and conifers removed. Various levels of road building and harvesting has continued in the watershed.

3.3.B.3 Pollutant Source Inventory

Point Source Discharges
No point source discharges exist in the Kalispell Creek watershed.

Nonpoint Sediment Sources

Fire and Historical Timber Harvesting - The 1926 wildfire burned within the headwater lands of the southern and western streams (Figure 2-6). The fire did not completely consume conifers and downed woody debris within floodplains and over stream channels, thus there was material in place to help maintain channel stability and fish habitat (USFS 1998c). The Diamond Match timber company, aided by the CCC, followed the fire by salvage logging, and logging of unburnt white pine, spruce and hemlock. This post-1926 harvesting was done by building a narrow gage railroad, plus chutes, trestles, tow paths, and some roads. Some of the transportation structure was built in riparian zones and adjacent to streams. Also, there was logging within the riparian zones.

Another major fire occurred in 1939 throughout the upper one-third of the watershed as well as near the lake, reburning much of the 1926 fire area. The 1939 fire covered 9,300 acres (USFS 1998c). This was a heat intensive fire with most trees consumed along with downed woody debris, including trees and debris within riparian zones. After this fire another round of salvage logging began, along with construction of a road network.

Based on the degree of hydrologic openings created by fire and logging, the likely erosion and failures of cut and fill slopes upon which the railroad was built, and erosion from the early road network, there undoubtedly was a tremendous sediment yield to watershed streams, and the sediment load exceeded the streams capacity to transport it (USFS 1998c). Many of the low quality habitat parameters measured today, such as high width to depth ratios, and high percent fines and embeddedness, are thought to in part reflect this early to mid century history. Additionally, there was significant fire and human disturbance within the riparian zone which affected stream canopy closure, stream bank stability, and recruitment of woody debris to aid in channel stabilization and pool formation.

Current Timber Harvesting, Roads, and Stream Crossings - Since the 1950s about 19% of the Kalispell Creek drainage has been harvested (USFS 1998c). Data presented here from the GIS analysis of the road network is for the Kalispell Creek 6th order subwatershed (19,844 acres), excluding the Diamond Creek upper subwatershed. There are 93.4 miles of total roads (Figure 3-15c), for a moderate density of 3.0 mi/mi^2. This includes closed roads and spurs in which some are vegetatively stabilized, and it excludes documented obliterated roads. Active roads that are either open or have access controls total 59 miles, or 1.9 mi/mi^2, well below the basin-wide average. An IDL - CWE assessment was conducted in 1998, and

21 miles of road were surveyed. Overall sediment delivery was rated as "low", but 3 localities of Significant Management Problems were recorded along the upper Forest Road 308, and 1.5 miles of upper Road 308 received moderate CWE road sediment scores (Figure 3-15c).

Stream crossing density of the total road network is 0.8 crossings/mile of stream (43 total crossings), which is below average compared basin-wide. The majority of crossings are over perennial streams.

Based on the sediment load calculations presented in Section 4, the total road network including failures along the road prism, is estimated to increase sediment load over the natural forested land yield by 47% (assuming 100% delivery to streams).

Encroaching and Riparian Roads, and Instream Erosion **-** Forest Road 308 (Kalispell Creek Road) travels up the valley floor of the middle segment of Kalispell Creek, west of Hwy 57, and 3.3 miles of this road is within a 200 ft zone from the stream, and 0.9 miles is within the 50 ft encroaching zone (Figure 3-15c). Historically this was the rail route for salvage logging. Road 308 is a well traveled and maintained transportation road with a surface of compacted aggregate. Undoubtedly, there is sediment produced from the road surface, cut banks, and ditches delivered to the stream, but more importantly, the road constricts the stream and reduces the effective floodplain and riparian area of the reach. USFS is considering obliterating this road stretch and relocating it along a more northerly route (USFS 1998c). For the Kalispell Creek subwatershed, the length of total road network within a 200 ft zone of watershed streams equals 13.8 miles, or 0.3 mi/mi of stream, and density of active roads is 0.2 mi/mi of stream.

Sediment load calculations may take into account instream erosion related to the length of floodplain encroaching roads (within 50 ft of the stream), as the road can interfere with the stream's natural tendency to seek a steady state gradient (Harvey 2000a). During high discharge periods the stream may erode at the road bed or fill slope, or if the road is sufficiently armored, the confined stream energy may erode the stream banks and the stream bed. Using the calculation method presented in Section 4 from the Coeur d'Alene basin TMDL (Harvey 2000a), produces 165 tons/yr for the 0.9 mile stretch of encroaching Road 308 (erosion from two stream banks and the streambed).

The stream bank erosion survey conducted in 2000 (methods described in Section 4), assessed 1.1 miles of mid Kalispell Creek along Road 308, in which a portion of the assessment reach was adjacent to the 50 ft encroaching road segment. Of the total stream reach assessed, 14% of the length was found to have either one stream bank or both with evidence of a recent eroded condition. A statistical work-up of the survey data leading to an estimate of lateral recession (data analysis by the NRCS, Sampson *pers comm*), produced a moderate erosion rate of 18 tons/stream mile/yr for the 1.1 mile assessed.

A downstream, 1.7 mile segment of Kalispell Creek east of Hwy 57 was also assessed for bank erosion, and the length of eroding bank was 8% of the total reach assessed. Data analysis produced a stream bank erosion rate of 20 tons/stream mile/yr (a greater composite score of erosion rating factors than the upper segment).

It is uncertain how the estimates of current instream erosion relates in degree to factors such as incoming watershed sediment load, peak flows, hydrologic disequilibrium, riparian condition, or the historic stream bed load of sand deposits.

Canopy Cover and Peak Flows **-** The IDL - CWE assessment was unable to produce a canopy cover map and canopy removal index due to an incomplete set of available aerial photographs and ortho-photoquads. Current estimates by USFS is that 38% of the watershed is still not reforested.

Mass Wasting **-** The IDL - CWE inventory did not report any occurrences of mass failures. While mass failures have occurred in the watershed, their frequency rate appears very low.

Agriculture - Impact of agriculture is minor in this watershed. Conversion of the lower section of Bismark Meadows to hay cropping, through cross drainages, eliminated some historic meandering and floodplain effectiveness. There are only a few head of cattle that have direct access to the stream. Sediment delivery has been observed when drainage channels are mechanically re-deepened, and the spoils are piled on top of the ditch bank. Rain storms wash the loose soil back into the ditch where it is then delivered to the stream.

Urbanization - There is residential development surrounding the mouth of Kalispell Creek. There have been observations of sediment laden stormwater runoff from access roads, driveways, and home lot development being delivered into the stream. West of Hwy 57 there is development of rural homesteads off Kalispell Creek Road. The IDL - CWE inventory reported several driveways in this stretch that were in poor condition and eroding badly. Near the corner of Hwy 57 and Road 308, a gravel mining operation has recently begun, very close to Kalispell Creek. Erosion control measures have been mandated as part of the mining permit, but compliance will have to be closely monitored.

Watershed Sediment Load Calculations - As developed in Section 4, the natural or background sediment load into Kalispell Creek has been estimated at 722 tons/year (assuming 100% delivery). When calculating current sediment load from forested acres, the total road network, stream crossing failures, road prism mass failures, and hay land, the estimated load of 1,070 tons/year is 48% above background, the lowest increase of the five watersheds calculated for sediment load in these categories (Table 4-1). Keeping the sediment yield at a relative low level for Kalispell Creek drainage was a moderate road density and stream crossing frequency, and minor occurrences of road failures based on USFS road maintenance experiences of the past 10 years (Janecek Cobb *pers comm*). When adding an instream bank erosion estimate of 225 tons/yr over 12 miles of gradual gradient main stem, the percent increase over background jumps to 84% (with no estimate of natural stream bank erosion).

3.3.B.4 Summary of Past and Present Pollution Control Efforts

See Section 2.4.2, page 60 for Forest Plan of the Idaho Panhandle National Forests.

3.3.B.5 Water Quality Concerns & Status

Refer to Table A-4 for the history of DEQ §305(b) and §303(d) listings for Kalispell Creek; Table 2-6 for designated and existing beneficial uses; and Table 2-12 for determined support status of designated and existing beneficial uses.

3.3.B.6 Summary and Analysis of Existing WQ Data

A daily hydrograph was established for Kalispell Creek for WY 94 and 95 from stream gauging and numerous flow measurements (Rothrock and Mosier 1997). Peak flow for WY 95 was from early April to early May at 130 - 150 cfs (Figure 3-16). Peak runoff was associated with maximum air temperatures between 60 - 75 °F and spring rains. A late winter peak of around 100 cfs occurred in March associated with initial warming and rains. Summer base flow is around 15 - 20 cfs. The annual volume of water delivered from Kalispell Creek in WY 95 was estimated at 27,460 ac-ft.

A total of 32 water quality sampling runs were conducted between 1993 - 1995, in addition to 15 ISCO samples taken during spring runoff of 1995. During peak flow there can be relatively high (for the lake basin) suspended sediment concentrations. Maximum TSS sampled was 65 mg/L (25 NTU turbidity) with an associated maximum total phosphorus of 120 *u*g/L. Mean TP for spring runoff was 35 *u*g/L, highest in the lake basin. In base flow conditions with low suspended material, TP is also relatively high for lake basin streams, averaging 17 *u*g/L. Total nitrogen is moderate, averaging 120 *u*g/L.

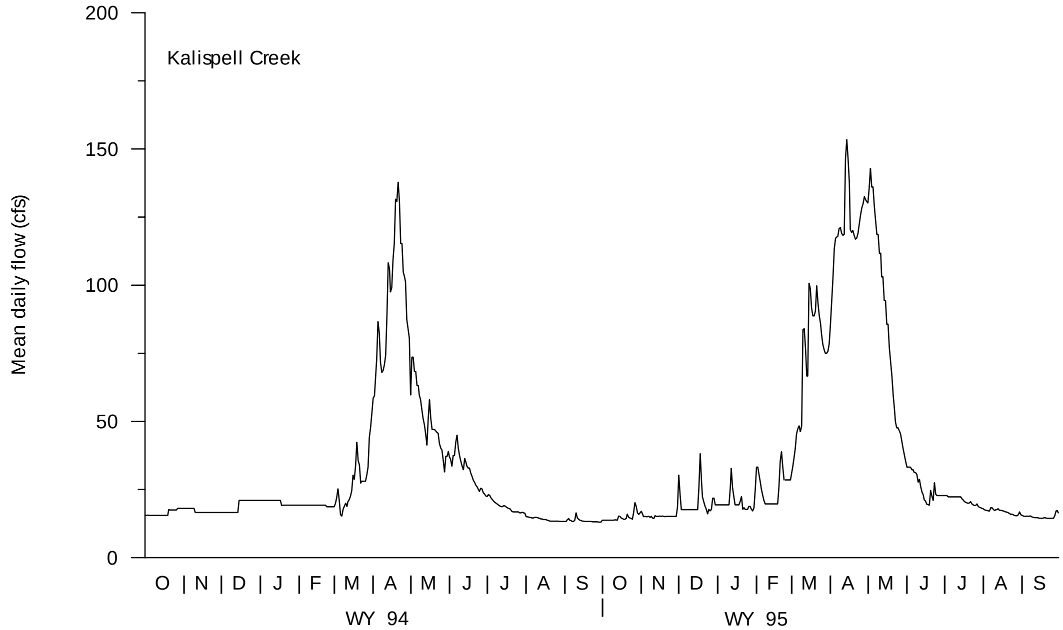


Figure 3-16. Mean daily flow rate for Kalispell Creek, water years 1994 and 1995.

Numerous instream measurements were taken of pH and DO with no numeric criteria exceedances. Highest instantaneous temperature recorded was 12.3°C. DEQ placed a temperature sensor near the mouth of Kalispell Creek from August 8 - October 25, 1997. Mean daily temperature over this period was 10.3°C, highest daily mean was 12.5°C, and maximum hourly temperature was 14.8°C. For the entire period of August through the end of September, the EPA bull trout criteria was exceeded.

Fourteen samples were taken for fecal coliform bacteria. The maximum bacteria count was 90 FC colonies/100 ml, and all other results ranged between <1 - 28 FC/100 ml.

The BURP MBIs for 1995 were 3.1 at a lower site and 3.3 at a middle site (Needs Verification, see Figure 3-15a for localities). BURP was repeated in 1997 with MBI=4.4 at a lower site, and MBI=4.0 at a middle site (Full Support). Averaged together the MBIs are 3.7 (FS) at both lower and middle reaches. For a single upper BURP site sampled in 1998, MBI=4.0.

Results of USFS electro-fishing in 1996 at three sites in Kalispell Creek, and 1998 surveys in selected tributaries, are presented in Table 3-8. As cautioned before, these surveys were primarily meant as presence/absence sampling, but with stream length and width recorded the data could be converted to fish densities. Also presented are DEQ BURP results from electro-fishing in 2000 at 2 main stem sites.

Brook trout captured included young-of-the-year and older age classes. Brook trout density within the main stem is considered low. Cutthroat trout were absent or extremely low in numbers. The densities from Kalispell Creek USFS sites F2 and F3 represent only 1 cutthroat at each site, and only 2 cutthroat were captured by DEQ at the 1997 BURP site. USFS field notes also mention 1996 electro-fishing surveys in other tributaries besides those listed in Table 3-8 (inventory sheets could not be found). Cutthroat trout distribution was found restricted to steeper gradient headwater reaches, or reaches above natural and man made barriers, in Chute, Kalispell, Deerhorn, Bath, and Nuisance Creeks (USFS 1998c).

Table 3-8. Electro-Fishing Results by USFS within Kalispell Creek and Tributaries, 1996 and 1998; and by DEQ BURP in 2000.

Data in fish/100 m²									
	USFS 1996 Kalispell Creek[a]			USFS 1998 Tributaries				DEQ 2000 - Main Stem BURP Sites[b]	
	Site F1	Site F2	Site F3	Rapid Creek	Virgin Creek	Bath Creek	Hungry Creek	1995 Lower Site	1997 Middle Site
Cutthroat trout	0	0.1	0.1	0	0	0	0	0	0.3
Brook trout	3.7	2.1	3.3	0	0	11.4	5.3	0.9	1.4
Sculpin	2.0	0.6	0.6	0	0	0	0	5.5	0.6

a = Refer to Figure 3-15a for locations of 1996 electro-fishing sites
b = Refer to Figure 3-15a for locations of 2000 electro-fishing sites

In 1992 another USFS electro-fishing survey was documented by narrative notes, in the vicinity of Hungry Creek confluence with Kalispell Creek. Shocking downstream of the confluence, mainly in pools, brook trout were present and numerous, ranging from fry to 10 inches. Cutthroat trout distribution was spotty, mostly found only in high quality pools. Cutthroats were in the 4-6 inch range, with no fry sampled. Sampling was also conducted in Hungry Creek, with a dominance of brook trout and a few cutthroat sampled.

The 1992 - 2000 fish sampling results have been compared to USFS sampling in 1983 and 1984, and the conclusion is that cutthroat trout have diminished in both numbers and distribution (USFS 1998c). In earlier sampling, cutthroats were found in moderate density in main Kalispell Creek above Rapids Creek confluence.

The BURP Habitat Index scores from the two lower sites were: a poor HI=70 for 1995, and an adequate HI=95 for 1997 (both C channel). Parameters with below mid-point scores included: percent fines (44 - 52%), instream cover, embeddedness, and for the 1995 site, a very poor slow/fast ratio of 0.07.

BURP scores for the two middle sites were HI=74 for 1995 (C channel), and HI=92 for 1997 (B channel). The C channel site had a high 93% fines, high embeddedness, and poor lower bank stability. The B channel site had far less fines and degree of embeddedness. The right stream bank was impacted by the adjacent Forest Road 308. At both sites the slow/fast ratio was poor at 0.2. At all four BURP sites the wetted width/depth ratios were at or below the basin average, ranging from 16 - 27.

At the 1998 upper site, HI=77 (B channel). Below mid-point scores included: percent fines (53%), instream cover, embeddedness, a slow/fast ratio of 0.2, and a poor width/depth ratio of 37.

The 1992 DEQ Use Attainability survey gave a similar picture of below average habitat conditions. A lower reach site east of Hwy 57 was rated overall as "fair" for habitat score, with poor instream cover and pool complexity. While pool frequency was low at 1.3 pools/100 m, volume was above average for the 3 - 5 m wetted width group, with RPV = 695 m^3/km. A middle reach site, downstream of the 1997 middle BURP site, was rated overall as "poor-fair" for habitat score, with similar characteristics as above. Here though, pool frequency was good with 6.4 pools/100 m (lateral scour pools), and volume was just below average at RPV = 220 m^3/km.

Habitat surveys were conducted by USFS in 1992 and 1993 within Kalispell Creek and several tributaries. A selected set of parameters is presented in Table 3-9 (USFS 1998c). Individual residual pool volume (IRPV) for Kalispell main stem averaged 30.4 m^3, excluding beaver created pools, and this seems to be well above average compared to other west side streams of similar wetted width. Beavers create the largest pools in the Kalispell watershed averaging between 67 - 217 m^3 IRPV. These large beaver pools offer good over-wintering and rearing habitat for fish (USFS 1998c). While the main stem IRPV may be good, BURP data shows a very low frequency of pools, so when extrapolated to Residual Pool Volume/km, available volume per length drops substantially. Note that in some the of tributaries such as Kalispell headwaters, Chute, Nuisance, and Bath Creeks, IRPV is less than 2 m^3, substantially less than measured within Hungry Creek and Mush Creek.

Various factors were used by USFS to rate pool quality, and qualitative ratings showed overall a very low percentage of high quality pools except for Hungry and Mush Creeks (Table 3-9). USFS evaluation of the Kalispell Creek data is that a stream the size of Kalispell Creek should have more high quality pools (USFS 1998c). Percent fines data for Kalispell Creek C and B channel type again indicates that spawning habitat is not of high quality, with highly covered or embedded gravel and cobble. Percent fines in tributary, B channel spawning habitat was low - moderate ranging from 17 - 38%, but note an embeddedness around 50% for Chute, Hungry, and Rapids Creek.

Table 3-9. Summary of Selected Habit Parameters from USFS Surveys within Kalispell Creek and Tributaries, 1992 and 1993.

	Individual Residual Pool Volume in cubic meters		Pool Quality Rating in Percent			Percent Fines in Pools, Tailouts, Runs, and Glides		
Stream	Mean w/o beaver ponds	Range of all Pools	Low	Moderate	High	C Channel	B Channel	%Embed-dedness
Kalispell Main stem	30.4	16-119	33	54	13	54	40	--
Kalispell Headwaters	1.5	1-2	80	20	--	--	--	--
Nuisance Crk	1.7	1-3	96	2	2	--	--	--
Chute Creek	1.8	1-3	97	--	3	--	31	53
Bath Creek	5.7	2-153	80	12	8	--	--	--
Hungry Creek	116.3	63-217	8	39	53	--	17	50
Virgin Creek	1.4	1-72	98	1	1	--	38	29
Rapids Creek	0.6	0.1-3	100	--	--	--	26	47
Mush Creek	88.5	55-122	9	33	58	--	--	--

3.3.B.7 Status of Beneficial Uses

The 1995 BURP MBI results for the lower and middle sites are Needs Verification. Examining the DEQ - RIBI fish assemblage questions (IDEQ 1996), the RIBI result for Kalispell Creek is NV due to the dominance of the introduced brook trout and reduced numbers of native cutthroat trout. Continuing with the Determination Flow Chart (Figure 2-10), the 1995 HIs were <100, so the status call remains NV. The 1997 MBIs for the lower and middle sites were Full Support, as well as the 1998 upper site.

Based on the USFS and DEQ electro-fishing surveys, along with the array of habitat evaluations, the data strongly suggests that cold water biota beneficial use is impaired as reflected by the continued decline of cutthroat populations along with a relative low density of brook trout. This condition is in part due to an excess of sand bedload, along with other factors identified in this section. The status call becomes Not Full Support.

The USFS and DEQ fish data shows Full Support for salmonid spawning beneficial use using brook trout for juveniles and two older age classes, and the assumption that the minor presence of 4-6 inch cutthroat trout equates to spawning of the resident population.

Sufficient fecal coliform bacteria samples were collected to assign FS to primary contact recreation. Domestic water supply use of Kalispell Creek is isolated to single family residences, so the turbidity criteria does not apply. The toxic substance criteria was Not Assessed.

There is insufficient temperature data in July to judge the Standards cutthroat spawning and incubation criteria. Temperature data for August and September shows exceedance of the EPA bull trout criteria.

3.3.B.8 Data Gaps

A continuous recording temperature sensor needs to be placed within the main stem of Kalispell Creek beginning in spring to evaluate the Standards cutthroat spawning and incubation criteria.

3.4 §303(d) Listed Streams: Currently, Insufficient Information to Completely Assess Beneficial Use Status, and Recommended for Deferral until Evaluated by the 2002 §303(d) List

A. Reeder Creek from Elevation 2680 ft to the Mouth

Refer to Section 3.2.A, page 91.

B. East River Main Stem

Refer to Section 3.2.B, page 97

C. Binarch Creek

Summary

Binarch Creek was added to the 1994 §303(d) list, and retained on the 1996 list, as a result of EPA analysis of the 1992 §305(b) report, Appendix D, in which IDFG evaluated cold water biota and salmonid spawning as partial support. The listed pollutant is sediment. Binarch Creek was retained on the 1998 §303(d) List (DEQ 1999).

Binarch Creek is a small stream system that has been difficult to assess because a major length of the stream is low to moderate gradient and has extensive senescent and active beaver complexes which have created large pools, glides, and marshes, and has also resulted in several reaches where the stream goes subsurface, or becomes intermittent. Two BURP sites within beaver complexes resulted in one MBI score of 3.6 (Full Support), and one score of 2.6, the lowest MBI in the basin (although still above Not Full Support). The macroinvertebrate community structure in these slow water, sediment laden environments might be expected to be different than the ecoregion reference of fast moving water over riffles. A BURP site in the lowest stream reach, B channel type, did show FS (MBI=4.5).

The entire watershed is Idaho Panhandle National Forest land, and a major area of the middle stream reach has been designated by the USFS as a Research Natural Area (RNA). The RNA designation was made in part, because of an unusually diverse assemblage of aquatic plants and animals including a pure strain of westslope cutthroat trout. However, DEQ electro-fishing in 2000 at a single site below the RNA boundary resulted in just four fish captured, all cutthroat trout, for a low density of 0.8 cutthroat/100 m^2. This electro-fishing result did not meet the WBAG Full Support criteria for salmonid spawning. IDFG electro-fishing (1987) within the lower-most B channel reach showed a moderate brook trout density.

Based only on the single DEQ electro-fishing effort, the middle segment of Binarch Creek appears to have a salmonid density less than what might be expected as Full Support of cold water biota beneficial use. Habitat surveys show significant stretches of high sediment deposition, but in many cases this has been attributed to settling behind beaver dams, and then movement of sediment when dams fail. USFS habitat surveys do conclude that several B channel reaches have poor pool habitat due to aggradation of sediment, and a part of this sediment build-up can be attributed to fairly extensive historic timber harvest activity and associated road network (USFS 1998b). For salmonid spawning beneficial use, it is known from USFS field observations that there are self-propagating populations of both brook trout and cutthroat trout, and in reality salmonid spawning beneficial use is probably Full Support.

In their comment package to the draft Subbasin Assessment, USFS stated that there has been extensive surveys of the streams, road networks, and timbered units, and current sources of sediment that may reach Binarch Creek are considered to be minimal (USFS 2000b). The USFS documented plans for remediation of inventoried sediment sources. In addition, there are numerous land use restrictions within the boundaries of the Binarch RNA. The DEQ sediment calculations presented in Section 4 and summarized in this section suggest a low – moderate current sediment load.

This SBA concludes that the low gradient middle reach of Binarch Creek is Not Full Support of cold water biota beneficial use based on the average MBI of 3.1 from two BURP sites, and low trout densities at a single electro-fishing reach. However, the available current fish data is considered insufficient to make an informed status call. It is recommended that Binarch Creek remain on the §303(d) list, and that a beneficial use status call is deferred until a more thorough fish survey can be conducted during the summer of 2001, preferably within the boundaries of the RNA. USFS has verbally committed to conduct this survey.

In the draft SBA and TMDL (December 2000), Binarch Creek was recommended for de-listing from the §303(d) list with sediment as the listed pollutant of concern. This recommendation was based on the sediment calculation results which suggested that the current sediment yield to Binarch Creek is insufficient to impair or prohibit recovery of a Full Support cold water biota beneficial use. However, the Priest Lake WAG in their consideration of the draft SBA and TMDL, recommended that the current status call of Not Full Support warrants that a stream not be de-listed. This is the same conclusion and recommendation stated in the EPA comment package (EPA 2001)

3.4.C.1 Physical and Biological Characteristics

Binarch Creek is a 2nd order tributary on the west side of Lower Priest River (Figure 2-2), flowing southeast to the river. Main stem length is 8.5 miles, and watershed size is 7,232 acres (Table 2-2). The watershed is mostly forested and steep sloped, ranging in elevation from 2,420 ft at the river to 4,170 ft at Binarch Mountain. The stream is mostly low to moderate gradient meandering through an uncontained floodplain in a wide valley bottom. Annual average precipitation increases from 32 inches at the mouth to approximately 35 inches at high elevations. Precipitation is 25 - 50% snow with a snowmelt dominated runoff pattern. Based on the daily hydrograph established at Lamb Creek immediately to the north (Figure 3-8), peak flow is during mid-March through late April.

The lower two-thirds of the watershed is primarily residual metamorphic belt rock, while the upper headwater lands are residual granitic batholith (Figure 2-4 and Figure 4-2). The lower valley is outwash and alluvial sediment deposits.

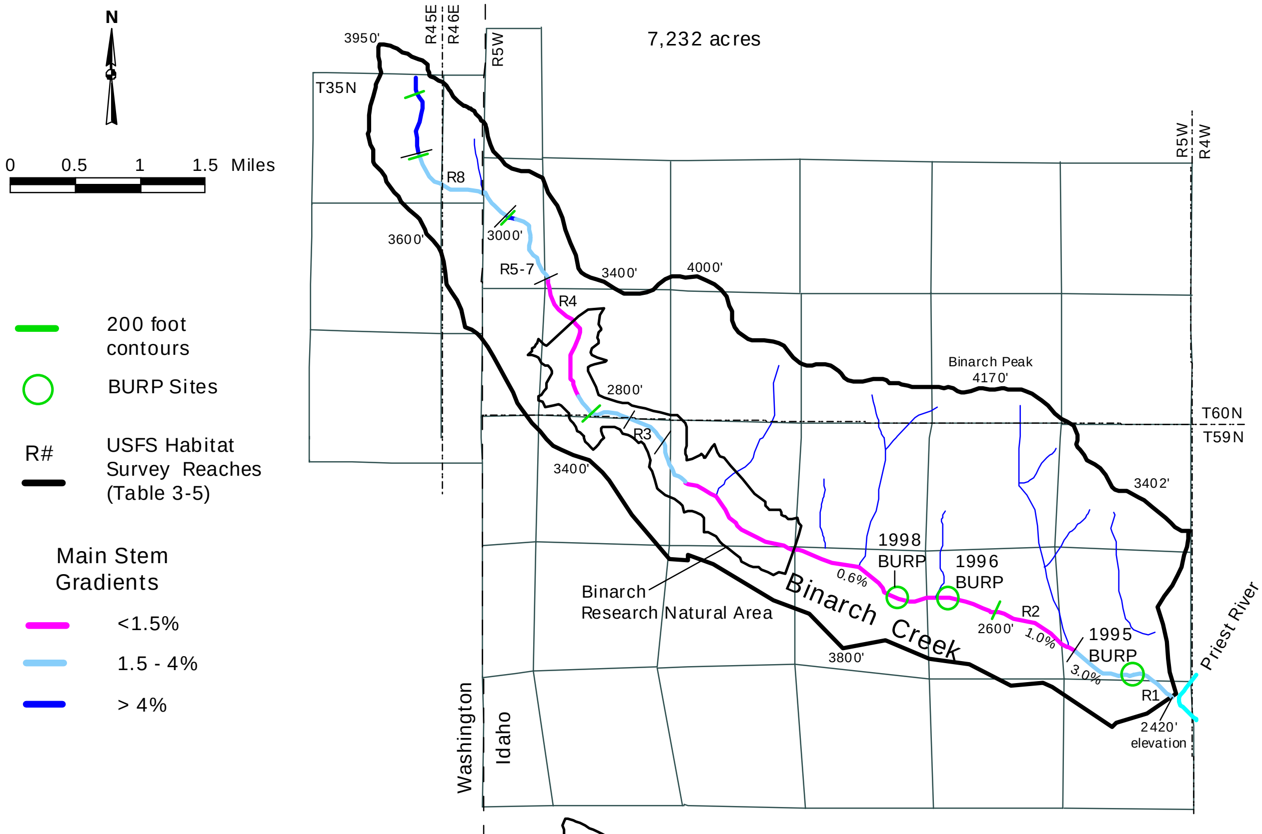
Around 1890 almost the entire drainage of Binarch Creek was burned in a large wildfire (Figure 2-6, USFS 1999). No other large fires have occurred in the drainage since then. An area left unburnt in the 1890 fire is presently included in the Binarch RNA.

From the confluence with Lower Priest River, the first 1 mile upstream is B channel with an average 3% gradient (Figure 3-17a). Then there is a 5.7 mile middle stretch that is mainly E4/E5 channel with a 0.5 - 1.4% gradient, but includes a 1.2 mile reach that is 2% gradient B channel. Beyond this middle section is B channel turning to A channel headwaters.

USFS reports that beaver dams are abundant and play an important role in the ecology of Binarch Creek (USFS 1999). Historically, the stream was a series of beaver dams and ponds, but the beaver population was largely trapped out. As older dams failed, there was no replacement by new ones. Subsequently, large volumes of sediment began moving through the lower reaches of the stream. It appears that the beaver populations are recovering, and with creation of new dams the USFS anticipates an improvement in the overall condition of Binarch Creek over time as the stream trends toward stability (USFS 1999).

Ecological roles of beaver dams and ponds in Binarch Creek, both active and senescent dams (abandoned dams as food supply of alders, cottonwoods and willows are used up), include: 1) raised water levels expanding wetlands and wet meadows, 2) settling of watershed sediment which may lead to pond filling and formation of vegetated land forms, 3) promotes abundant stream side vegetation providing excellent

Figure 3-17a. Binarch Creek Watersheds: streams, BURP sites, and gradients.



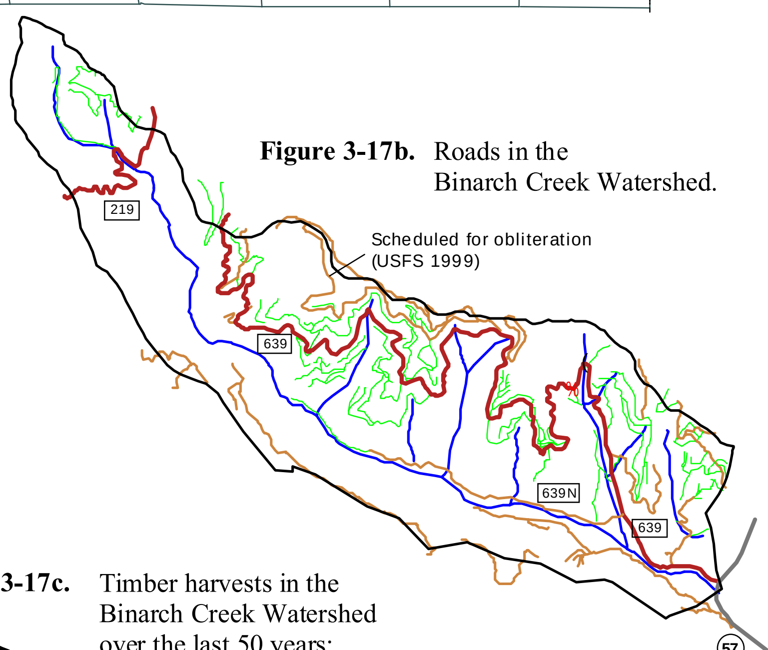


Figure 3-17b. Roads in the Binarch Creek Watershed.

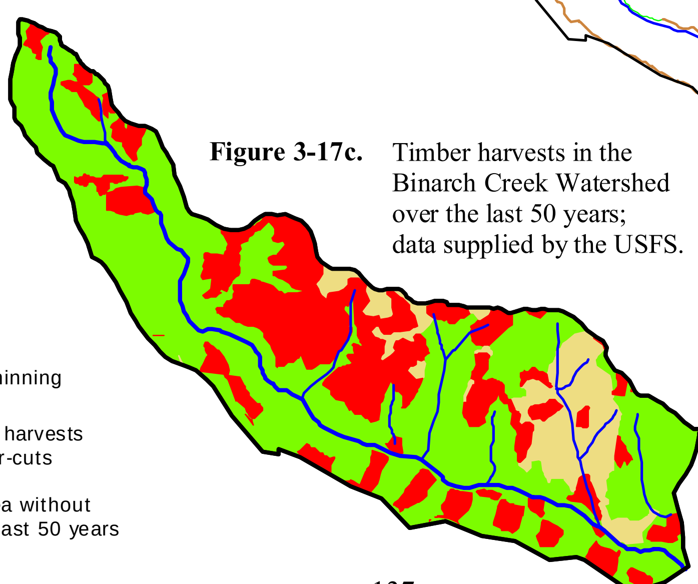


Figure 3-17c. Timber harvests in the Binarch Creek Watershed over the last 50 years; data supplied by the USFS.

cover for fish, 4) pond filling may force stream segments to go subsurface, 5) increases stream stability by decreasing flow velocity, and 6) in general offers excellent over-wintering and rearing habitat for fish. However, a dynamic stream equilibrium would also provide complex habitat, such that in segments not impounded by beavers there would be high quality pools formed by LWD and scour, and low gradient riffles with suitable gravels and cobbles for spawning. It appears that the middle reach of Binarch Creek has a low quality and quantity of this latter habitat type.

In 1989 the 660 acre Binarch RNA was established (Figure 3-17a). RNA status was justified on principle distinguishing features (USFS 1989), including: 1) a low-gradient, meandering stream representative of glaciated northern Idaho, 2) senescent and active beaver dams and ponds, 3) marshes and wet meadows, 4) diverse assemblage of aquatic plants and animals (greatest diversity among 32 streams examined in northern Idaho, Rabe and Savage 1977), and 5) presence of a pure strain of westslope cutthroat trout.

A 1975 sampling by University of Idaho collected 15 cutthroat trout from mid Binarch Creek for analysis of species purity (USFS file notes). These fish were found to be a pure strain of westslope cutthroat trout, *Salmo clarki lewisii* (USFS 1989). This native species hybridizes readily with both introduced hatchery bred cutthroat and rainbow trout (both introduced at one time in the Lower Priest River system). There are only a few populations of pure westslope that remain in Idaho. A prevailing theory for the pure strain is their isolation within the RNA from other migrating fish due to beaver dams and segments of subsurface flow (dry channels).

Electro-fishing surveys by IDFG and DEQ within lower to mid-lower reaches below the RNA, showed low cutthroat density and low - moderate brook trout density. USFS field observations would indicate that brook trout are abundant throughout the stream. In the past, the stream had been stocked with brown trout and rainbow trout (USFS 1999). It is unknown if bull trout inhabited Binarch Creek historically, but they are suspected to be not present now, and the stream is considered low priority in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

3.4.C.2 Cultural Characteristics

The entire Binarch Creek watershed is National Forest land. The RNA is 660 acres, and the remaining 6,572 acres is managed by the USFS for timber production. Because of the large fire around 1890, little historic logging occurred in the drainage, and the majority of harvesting has occurred since the 1960s. Around 43% of the watershed has been harvested (USFS 2000a), and road density is moderate.

3.4.C.3 Pollutant Source Inventory

Point Source Discharges
No point source discharges exist in the Binarch Creek watershed.

Nonpoint Sediment Sources

Mass Wasting **-** An 1999 IDL - CWE assessment gave an inherent mass failure hazard rating of “high” to the drainage (a predominance of step slopes and unstable parent geology). During the CWE assessment however, only a single mass failure was reported (Figure 3-17b), associated with a cut slope, and sediment delivery was rated as minor.

Roads and Stream Crossings **-** GIS analysis of the road network provided by IDL produces 61 miles of total roads (Figure 3-17b), for a density of 5.4 mi/mi^2. This includes closed roads and spurs in which some are vegetatively stabilized, and it excludes documented obliterated roads. Active roads that are either open or have access controls total 25 miles, or a moderate 2.2 mi/mi^2. The 1999 CWE inventory assessed

15.6 miles of road. All road miles surveyed were given a road sediment delivery score of "low", and the scoring reflected minor to moderate road system erosion, and minor delivery to stream channels. The CWE inventory documented a single Significant Management Problem (Figure 3-17b), associated with a combination of road problems. Stream crossing density of the total road network is 1.2 crossings/mile of stream (20 total crossings), which is below average compared basin-wide. The majority of crossings are over intermittent channels. USFS reports that the stream crossing and encroaching sections of Road 219 in the headwaters (Figure 3-17b) is leading to some sedimentation and stream damage (USFS 1998b). Based on the sediment load calculations presented in Section 4, the total road network including failures along the road prism, is estimated to increase sediment load over the natural forested land yield by 73% (assuming 100% delivery to streams).

Encroaching and Riparian Roads - Forest road 639N travels up the valley floor of Binarch Creek for 3.6 miles (Figure 3-17b), and the majority of its length is within a 200 ft buffer zone from the stream, but very little of its length is within the 50 ft encroaching zone. The length of the total road network within a 200 ft buffer zone of watershed streams equals 6.8 miles, or 0.4 mi/mi of stream; but density of active roads within the buffer drops to one-half of this value.

Timber Harvesting and Peak Flows - USFS reports that 43% of the Binarch Creek watershed has had timber harvesting activity since 1950 (USFS 1998b, Figure 3-17c). The IDL - CWE estimated canopy removal index (CRI) was 0.14, seemingly underestimating timber removal. The average channel stability index (CSI) was 47, or a moderate rating. Coupling the CRI with the CSI produced a hydrologic risk rating (HRR) of "low".

3.4.C.4 Summary of Past and Present Pollution Control Efforts

See Section 2.4.2, page 60, for Forest Plan of the Idaho Panhandle National Forest. In addition, the Binarch Creek RNA status prohibits timber harvesting and cattle grazing within its boundaries, and also there is to be no construction of instream habitat improvement structures since one objective of an RNA is study of an undisturbed ecosystem. In their comment package to the draft SBA, USFS states that as a result of the Douglas-fir beetle EIS the agency identified opportunities to reduce runoff and improve exiting conditions in the drainage (USFS 2000b). Through timber sale receipts obtained from the Douglas-fir beetle project, USFS has scheduled restoration activities within the Binarch Creek drainage including: 1.5 miles of timber road obliteration; 1.2 miles of road reconstruction; and maintenance procedures over 14 miles of road (USFS 2001). The planned obliteration is a network of roads on the northern face of the Binarch drainage (see Figure 3-17b), to improve slope hydrology and reduce the risk of slope failure.

3.4.C.5 Water Quality Concerns & Status

Refer to Table A-8 for the history of DEQ §305(b) and §303(d) listings for Binarch Creek; Table 2-6 for designated and existing beneficial uses; and Table 2-12 for determined support status of designated and existing beneficial uses.

3.4.C.6 Summary and Analysis of Existing WQ Data

Peak flow for Binarch Creek is estimated between 55 - 60 cfs (Rothrock and Mosier 1997). Late summer base flow is around 2 - 3.5 cfs.

There have been no documented water quality samples taken from Binarch Creek, and no measurements of pH and DO. No samples for bacteria have been taken.

DEQ placed a temperature sensor within mid-lower Binarch Creek near the 1996 BURP site (Figure 3-17a), from June 24 - October 2, 2000. Upon visitation to extract the sensor, the stream segment was found dry. The last reliable data appears to be August 9. During the period of June 24 to August 9, mean daily temperatures ranged from 10.8 - 14.9°C, and daily maximum temperatures ranged from 10.9 - 17.1°C. The Standards cutthroat spawning and incubation temperature criterion was exceeded on all days from June 24 to July 31.

The BURP MBIs for Binarch Creek were: 4.5 for the 1995 lower site (Figure 3-17a); 2.6 for the 1996 mid-lower site (Needs Verification); and 3.6 for the 1998 mid-lower site. The 1998 sample was within a beaver complex, the BURP habitat reach was glide/pool, and the macroinvertebrate samples were collected in glides with silty substrate. The 1996 mid-lower site was also within a beaver complex, and the low MBI in part related to below average EPT representation with a dominance by Diptera in number of individuals.

Electro-fishing was conducted by IDFG in 1987 within a single reach in the lower-most B channel (Horner *et al*. 1988). Brook trout density was 3.2 fish/100 m^2, and cutthroat density was low at 0.2 fish/100 m^2. DEQ electro-fished in 2000 at the 1996 mid-lower BURP site. Cutthroat density was low at 0.8 fish/ 100 m^2 (4 fish captured), and no brook trout or sculpins were sampled. The length range of the 4 cutthroats was 100 - 179 mm (no juvenile cutthroats <100 mm).

The BURP HI for the 1995 lower site was good at HI=115. For the 1996 mid-lower site, the score was low at HI=77. This middle reach primarily consisted of runs and glides, sandy substrate, and a good deal of still water due to beaver dams. Scores below mid-point included 100% fines, poor instream cover, and high embeddedness. BURP notes stated that this reach was representative of a large section of stream surrounding the sampling site. The 1998 mid-lower site was also within a beaver complex with slow flow and sandy substrate. BURP notes describe the predominant habit as “bog”. An HI is not available as the habitat assessment sheet was incompletely scored. Field notes recorded 5 salmonids observed, 100 – 140 mm in length.

The 1992 DEQ Use Attainability survey was conducted at one site, in the same vicinity as the B channel BURP lower site. This habitat assessment, like the BURP HI score, gives a favorable habitat characteristic. The habitat score was rated overall as “good”, with a slow/fast ratio of 0.7, excellent instream cover, good bank vegetation and stability, and good pool complexity. Residual pool volume was good for the 3 - 5 m wetted width group, 291 m^3/km.

A fairly comprehensive habitat survey was conducted by USFS over much of Binarch Creek in October 1998 (USFS 1998b). The stream was divided into 8 reaches as shown in Figure 3-17a. A summary of USFS notations and measurements, including averages of percent fines within channels and pool tailouts as measured by Wolman pebble counts, are presented in Table 3-10.

3.4.C.7 Status of Beneficial Uses

The BURP MBI, fish data and habitat results show Full Support of cold water biota and salmonid spawning beneficial uses for the lower-most 1 mile of B channel. The average MBI for the two lower-middle sites (MBI=3.1) results in Needs Verification, but again these were samples taken within marshy beaver complexes. The DEQ electro-fishing result would indicate Not Full Support of cold water biota and salmonid spawning beneficial uses because of the few salmonids captured. USFS field observations and the 1975 University of Idaho sampling would indicate cutthroat and brook trout spawning within the middle reach.

There are insufficient pH and DO data to assess criteria exceedances. Likewise, there are no fecal coliform bacteria data to assess contact recreation. This stream would be considered secondary contact recreation.

Because cold water biota criteria does not equal FS, secondary contact recreation beneficial use is assigned Not Assessed. Domestic water supply of Binarch Creek is not an existing use.

Stream temperatures show that there are exceedances of the State Standards criteria for cutthroat trout spawning and incubation in late June and July.

3.3.D.8 Data Gaps

It is essential for USFS and/or DEQ to conduct an update survey of the salmonid populations within the middle and upper reaches of Binarch Creek to assess the current status of cutthroat trout within the RNA, and to clarify the support status of cold water biota and salmonid spawning beneficial uses.

Table 3-10. Habitat Survey Notes and Measurements of Binarch Creek from USFS Survey in October 1998.

Reach Number - Elevation	Channel Type	Reach Length (miles)	Average Substrate % Fines (0-8 mm)	Average Pool Tail-out % Fines	General Reach Features, Going Upstream
1 2400' - 2560'	B3	0.9	15	11	Found 10 artificial check dams, creating overall, adequate sized pools. Channel appears fairly stable. Riparian zone mostly conifers. W/D=15, low sinuosity.
2 2560' - 2720'	E5	3.8	93	88	Dry for first mile, then intermittent for remaining reach. Uncontained floodplain in wide valley bottom. 3 large abandoned beaver ponds. Directly below dams stream goes subsurface, and surfaces again upstream of the next dam. Most LWD located in dams, little LWD observed in channels. Riparian zone mostly shrubs and grasses. W/D=9, high sinuosity.
3 2720' - 2760	B3	0.4	--	--	Dry channel, no measurements taken. Riparian zone shrubs and grasses in flat gradients, conifers where there are steep forested walls.
4 2760' - 2880'	E4	1.4	61	75	Beginning of reach is tight valley, then opens up. Two large beaver ponds, and stream fluctuates between surface and subsurface between ponds. Last ¾ of reach, stream stays on surface. Riparian zone mostly shrubs and grasses. W/D=4, high sinuosity.
5, 6, 7 2880' - 3000	B4, E4, and B3	0.6	19, 73, 34	56, 72, 27	B channel drainage, highly confined with riparian conifers. Only a few pools, and pools that exist are poor quality and mostly filled with sand. W/D in B channels =11. E channel riparian mostly grasses, and banks are stable and healthy. Pools mostly meander formed.
8 3000' - 3200'	E4	0.9	33	39	Section of stream below Road 219 crossing is being influenced by road. Bank failures, channel migration, and stream divergence are common. Pool quality is poor. Above road crossing stream seems more stable. Pools are mainly meander formed, with little LWD incorporation. Riparian zone a mixture of shrubs and conifers. W/D=5, high sinuosity.

3.4 §303(d) Listed Streams: Currently, Insufficient Information to Completely Assess Beneficial Use Status, and Recommended for Deferral until Evaluated by the 2002 §303(d) List

D. Lower Priest River

Summary
Lower Priest River was added to the 1994 §303(d) list, and retained on the 1996 list, as a result of EPA analysis of the 1992 §305(b) report, Appendix D, in which DEQ evaluated domestic water supply and primary contact recreation as supported/threatened, and cold water biota and salmonid spawning as partial support. The listed pollutant is sediment. Lower Priest River was retained on the 1998 §303(d) List (IDEQ 1999).

There has been one BURP site on Lower Priest River (assessed in 1998) just above river mile 16 (Figure 3-18a). Data collected that can be used for judgement of aquatic life beneficial use status, using the Idaho River Ecological Assessment Framework (IREAF, IDEQ 2001) includes: 1) macroinvertebrate samples in which five metrics are calculated into a River Macroinvertebrate Index; 2) samples of periphyton collected on rocks in which ten selected diatom metrics are calculated into the River Diatom Index, and 3) water column physical and chemical parameters in which eight parameters are calculated into a River Physicochemical Index using the methods of the Oregon Water Quality Index (Cude 1998). Data from category 3 comes from the lower USGS station, at river mile 3.8. A fourth index is used in the IREAF, the River Fish Index, which is a composite of 10 fish metrics from electro-fishing surveys. IDFG has not conducted quantitative fish sampling within the river for at least 25 years. In 1998 the USGS conducted, for the first time, backpack and boat electro-fishing near the lower river USGS gauging station (Brennan *et al.* 2000). This data can be used to calculate the River Fish Index.

As of the writing of this SBA and TMDL, the Idaho River Ecological Assessment Framework is in draft form, and is undergoing peer review and has been distributed for public comment. Aquatic life beneficial use status for Lower Priest River can not yet be judged using this methodology. In addition, this author feels that a complete evaluation of beneficial use status cannot be made without a current fish population survey by IDFG. A written request by DEQ has been made to the Coeur d'Alene Regional Office of IDFG to conduct electro-fishing during the summer of 2001 at the minimum in the vicinity of the 1998 BURP site, and hopefully at additional river reaches.

For salmonid spawning beneficial use, the IREAF calls for support determination by the IDFG. Of the salmonid species that exist in Lower Priest River, the species that will primarily utilize river habitat for spawning is the mountain whitefish, *Prosopium williamsoni* (Horner *pers comm*). Brown trout and rainbow trout are frequently main stem spawners as well (Corsi *pers comm*). Bull trout, cutthroat trout, and brook trout will primarily migrate to tributary habitat for spawning. It is believed that mountain whitefish have maintained a viable population in the river (Horner *pers comm*). The USGS electro-fishing did capture 21 mountain whitefish (15% of total catch), ranging in length from 84 - 236 mm. This data suggests Full Support for salmonid spawning beneficial use.

Lastly, there are temperature exceedances of the Standards cold water biota criteria as the 1998 mean daily temperature exceeded 19°C from July through mid-August (Figure 3-19). Maximum mean daily temperature neared 24°C. Perhaps Lower Priest River is a candidate for the year 2000 Standards revision that added Seasonal Cold Water as an aquatic life use designation (IDAPA 58.01.02.250.03).

3.4.D.1 Physical and Biological Characteristics

Lower Priest River originates as outlet from Priest Lake and flows south to the confluence with Pend Oreille River. By the time it reaches its mouth, it is a 5th order river. The distance from Priest Lake outlet to the mouth is 45.5 river miles. The §303(d) listed segment of Lower Priest River begins at the tributary

Figure 3-18a. Drainage of 303(d) Listed Lower Priest River.

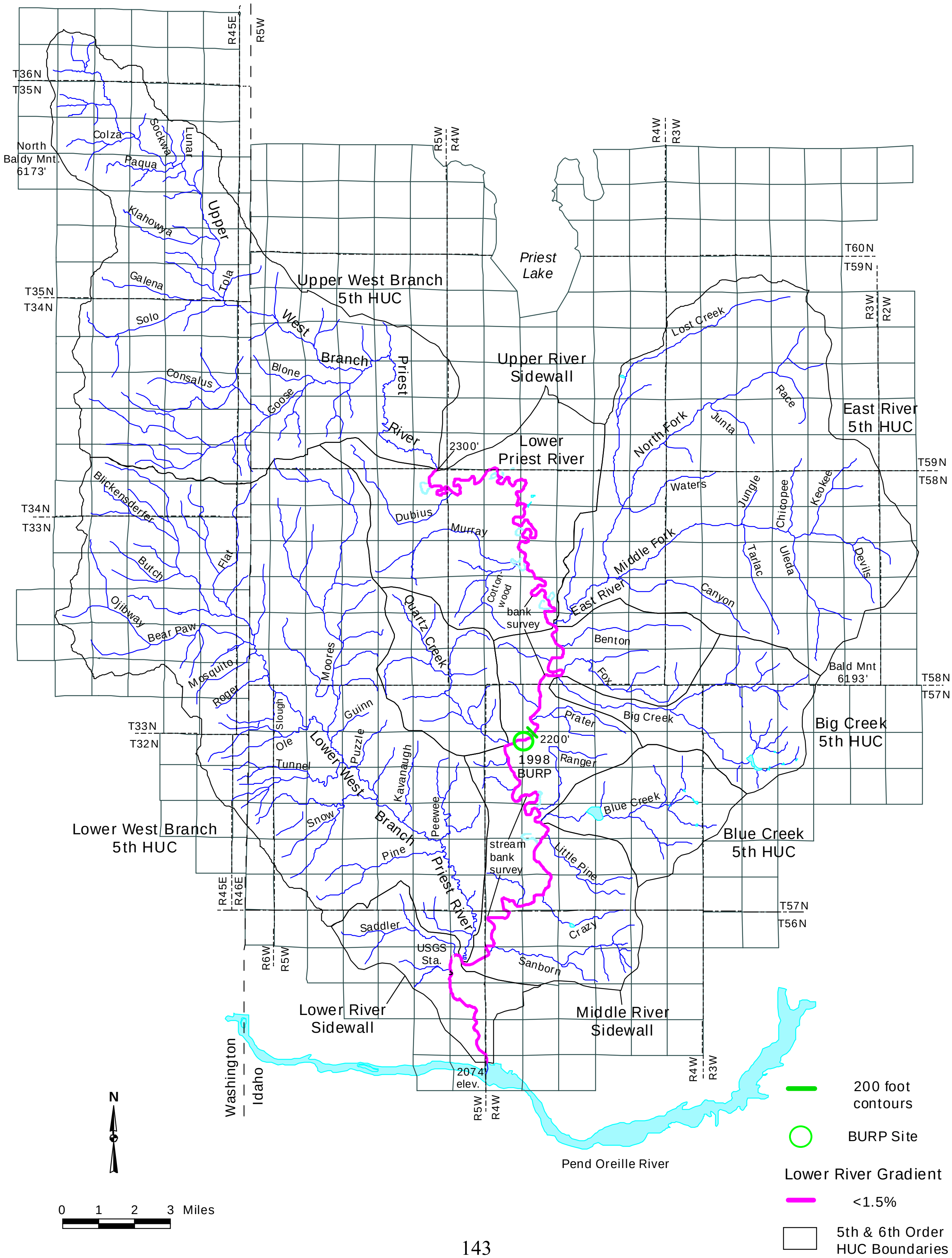
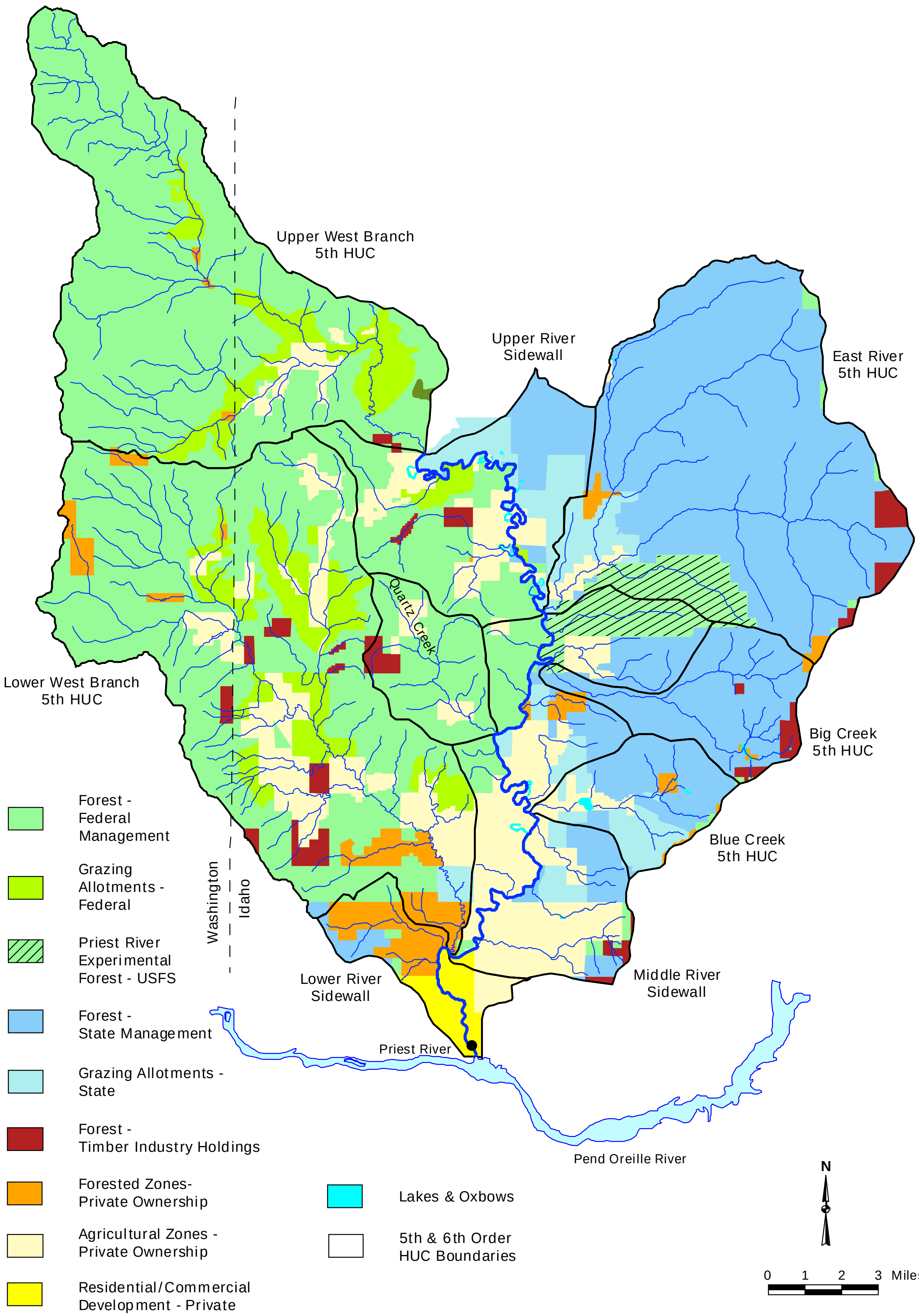


Figure 3-18b. General land use and ownership in the 303(d) listed Lower Priest River drainage.



inflow point of Upper West Branch Priest River. From this point to the mouth the distance is 35.3 river miles. Watershed size draining into the listed segment is large, 219,980 acres, with approximately 475 miles of perennial streams. Watershed size draining into the river between the lake outlet dam and the Upper West Branch confluence is 13,300 acres (Binarch Creek and any drainage from the upper portion of Jack Pine Flats). The §303(d) listed Lower Priest River drainage has been separated into nine, 5th or 6th order subwatersheds (Table 3-11 and Figure 3-18a). The 3 sidewall subwatersheds include numerous small 1st and 2nd order perennial streams. Two of the subwatersheds are §303(d) listed, Lower West Branch and East River, as well as Binarch Creek and Lamb Creek which flow into the river upstream of the listed segment.

Table 3-11. 5th & 6th Order Watersheds Draining into the §303(d) Listed Segment of Lower Priest River

Subwatershed	Acreage	Percent of Basin
Upper West Branch Priest River	45,201	20.5
Upper River Sidewall Dubius, Murray & Cottonwood Creeks	18,704	8.5
East River	43,165	19.6
Lower West Branch Priest River	56,835	25.8
Quartz Creek	7,081	3.2
Middle River Sidewall Benton, Fox, Prater, Ranger, Little Pine, Crazy, & Sanborn Creeks	26,989	11.8
Big Creek	9,354	4.3
Blue Creek	7,435	3.4
Lower River Sidewall Saddler Creek	6,217	2.8
Total	219,980	100

Elevation of the river at the lake outlet is 2,438 ft and drops to 2,074 ft at the mouth. The average gradient over this river length is 0.15%. The numerous 1st to 4th order tributaries flow mainly westerly or easterly into the river. Elevation on the eastern Selkirk mountains reaches 6,706 ft at Mount Casey, and along the western mountain range elevation tops out at 6,173 ft at North Baldy.

Precipitation increases from the average of 32 inches along the river valley to approximately 50 inches at the highest Selkirk peaks of the East River watershed. Precipitation is 25-50% snow with a snowmelt dominated runoff pattern. Peak flow is typically during early May through early June, and this represents high elevation snow melt with warm temperatures (see Figure 2-3 in section 2.1.1.2, page 11). There also is a substantial sub-peak between early March and late April and this represents late winter and early spring rain-on-snow events within the substantial acreage of flat, low elevation lands within the drainage.

Regarding parent geology, the valley floor and lowlands of tributaries are glacial till and outwash, alluvial, and lacustrine deposits; the majority of the surrounding eastern and northwestern hillslopes and mountains are granitic batholith; and there are substantial areas in the middle and southwestern sections of metamorphic belt rocks (Figure 2-4 and Figure 4-2). Only the valley floor and eastern slopes have been typed on the SCS general soil map (Figure 2-5 and Table 2-3).

Large stand-replacing wildfires occurred between 1880 - 1937 within: the upper one-half of the Upper West Branch watershed; the Quartz Creek watershed; adjacent to the middle of the river course; and the lower one-third of the Lower West Branch (Figure 2-6). The remaining portions of the drainage have received only scattered and isolated fires. There have been no large fires since 1950 with the exception of the Lost Creek subwatershed (East River), burnt as part of the 1967 Sundance fire. Currently there is considerable Douglas-fir beetle caused mortality.

High banks including fill banks from adjacent road construction confine a good deal of the river course. There are a few floodplains and adjacent wetlands, and some oxbows connected to the river with flowing water. Some banks of the river are lined with tall conifers, cottonwood, and shrubs; other banks have hay cropping and grazing down to the river's edge. Along six BURP transects, wetted width ranged 31 - 47 m, and bankfull width ranged 42 - 59 m. The river channel is a combination of riffles, runs and pools. There are significant areas of stream bed with cobbles and gravels.

Over the last 25 years there has been very little in the way of fisheries evaluation within the river. In 1998 the USGS conducted, for the first time, backpack and boat electro-fishing near the lower river station (Brennan *et al.* 2000). The only salmonid captured was mountain whitefish. Co-dominants in the sampling were largescale sucker and northern pikeminnow. Warm water game fish sampled were bluegill, largemouth bass, and yellow perch.

Summaries of fish sampling within many tributary drainages can be found in Table 2-10 and the watershed sections of East River (Section 3.2.B), and Lower West Branch (Section 3.3.A). Based on these tributary evaluations and stocking records, other salmonid fish species in the river would be brook trout, westslope cutthroat trout, rainbow trout, and brown trout. From conversations with long time local residents, it is known that the river was once a viable adfluvial cutthroat fishery (Broun *pers comm*), and adfluvial cutthroat are still caught. Based on electro-fishing within the Middle Fork East River, there may be a small fluvial subadult and adult bull trout population within the river. The river is considered of high importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

3.4.D.2 Cultural Characteristics

Watersheds of the §303(d) listed segment of Lower Priest River are a mixture of federal, state, and private ownership (Figure 3-18b). Land use activities have been described for two of the large subwatersheds, Lower West Branch and East River. Upper West Branch, another large 5th order subwatershed, has a similar land use pattern as described for Lower West Branch, except there is more National Forest land and less private agricultural land. The lower one-third of Priest River is surrounded by private land mostly labeled as an agricultural zone, but the last 3 river miles are in the urbanization zone of the city of Priest River. The upper one-third of the listed river segment flows through federal and state grazing allotment land and private agricultural lands.

Total private acreage in the drainage is 40,337 acres (18% of total, Table 2-5). Industrial timber holdings total 4,021 acres. Other private forested lands total 6,589 acres, about 20% of this in the State of Washington. Private lands that have been given an agricultural zone designation total a substantial 27,706 acres, most in Idaho. The defined residential zone around Priest River is 2,020 acres. Throughout the non-industrial private lands there are small scale NIPF timber operations.

The large private holdings in the lower one-third of the drainage were homesteaded beginning in the 1890s where settlers cleared the flatter lands for agriculture purposes and filed for the timber rights (USFS 1999). Land use activities included cross drains and wetland - wet meadow conversion, and there has been some minor channel modification of the river within the lower one-third of its course. Today, there is hay cropping and some cattle grazing along the river and tributaries. As more rural homesteads are being built there has been an increase in private roads and stream crossings, and hobby farm grazing by horses and cattle.

Land under USFS management totals 110,938 acres. Of this there is 16,309 acres in grazing allotments, and 6,256 acres as the Priest River Experimental Forest. Idaho State lands total 67,855 acres with 8,898 acres in grazing allotments.

The Lower Priest River drainage has had a long history of logging beginning in the late 1800s when valuable white pine was harvested (USFS 1999). A large timber sale occurred between 1912 and 1930 conducted by Dalkena Lumber Company, and mainly was selective logging of large and more valuable trees in the Lower West Branch and lower sections of Upper West Branch. Rail lines were built, paralleling streams to access timber areas, and logs were hauled to the river and floated to mills at the city of Priest River. Prior to construction of the first outlet dam at Priest Lake in 1950, the river was also used to transport logs cut within the Priest Lake basin. There has been a succession of timber sales on federal and state lands since the 1950s. The lower river basin is moderately to heavily roaded with total road density ranging from 5.0 - 7.1 mi/mi^2 within the main 5th order HUC watersheds (USFS 2000a).

3.4.D.3 Pollutant Source Inventory

Point Source Discharges

No point source discharges exist in the Lower Priest River drainage.

Nonpoint Sediment Sources

Discussion and examples of general sediment sources that are applicable within the lower river basin have been previously discussed in Section 2.3 (page 55), and more specifically for East River (Section 3.2.B) and Lower West Branch (Section 3.3.A). A brief description of Upper West Branch and Quartz Creek is presented the next Section (3.5.10 and 11). If it is determined that Lower Priest River has beneficial uses significantly impaired by sediment, then TMDL development will require a detailed analysis of all 5th order HUCs draining into the river similar in detail to what has been presented for East River and Lower West Branch. IDL - CWE assessments and inventories were conducted on the non-listed Upper West Branch and Quartz Creek drainages, and with CWE assessments on Lower West Branch and East River, these four subwatersheds account for around 80% of the drainage. In addition, USFS has conducted surveys on all lower west side watersheds in association with the Douglas-fir beetle EIS (USFS 1999).

One sediment source mentioned here is stream bank erosion along the river course. A bank erosion survey was conducted in September 2000 within two subsample reaches of the river: a 4.7 mile middle reach from river mile 23 down to mile 18; and 3.4 miles of a lower reach beginning at McAbee Falls down to river mile 7 (Figure 3-18a). Of the total middle river reach assessed, 45% of the length was found to have either one stream bank or both with evidence of a recent eroded condition; and percent bank with an eroded condition was 89% of the lower reach assessed. The average of the composite scores of erosion rating factors for both reaches were on the high end compared to wadable stream sections surveyed within the basin. A statistical work-up of the survey data leading to an estimate of lateral recession rate has not been completed at the time of this report.

Based on qualitative observations from the river bank survey, there were several segments of raw banks with signs of recent erosion and even chunks of upper bank broken off and slumped into the high water mark zone. Some segments had high raw banks, 20 ft high or so, with a thick layer of gravelly sand and silt loam overlaying a dense clay layer. This is a condition susceptible to slippage and mass failure. In a few cases bank slumping was associated with fill slopes of adjacent roads, such as just upstream of McAbee Falls.

One stream bank legacy issue of interest is related to the historic log drives down the river. Old photographs show a dense mat of logs bank to bank, and it is believed that the log drives did considerable damage to the banks.

3.4.D.4 Summary of Past and Present Pollution Control Efforts

See Section 2.4, page 59.

3.4.D.5 Water Quality Concerns & Status

Refer to Table A-10 for the history of DEQ §305(b) and §303(d) listings for Lower Priest River; Table 2-6 for designated and beneficial uses; and Table 2-12 for determined support status of designated and existing beneficial uses.

3.4.D.6 Summary and Analysis of Existing WQ Data

Hydrology for the lower river basin has previously been presented in Section 2.1.1.2 (page 11), including a WY 95 daily hydrograph of the river at the two USGS gauging stations (Figure 2-3). The two USGS stations closely bracket the drainage into the §303(d) listed segment. There is only minor flow from flatlands between the upper gauging station and the inflow point of Upper West Branch (Figure 3-18a), and there is also only minor flatland inflow between the lower station and the mouth.

Minimum river flow rate and water temperatures from mid summer through early fall in relation to rearing requirements for adult and juvenile cutthroat trout and adult rainbow trout, has been an issue of concern voiced by the Idaho Water Resource Board and the IDFG (IWRB 1995). These issues have previously been presented in Section 2.1.2.2 (page 24).

The River Physicochemical Index (PI) used with the Idaho River Ecological Assessment Framework (IDEQ 2001), as one component to judge aquatic life beneficial use, incorporates these parameters: dissolved oxygen (DO), pH, biochemical oxygen demand (BOD), total solids, ammonia+nitrate nitrogen, total phosphorus, fecal coliform, and water temperature. While the PI is not calculated in this SBA for reasons already stated in the Priest River Summary, available data are summarized below.

The USGS conducts routine water quality sampling at the lower gauging station every other year. Water sampling frequency for 1994 - 1998 has been 6 times per year, and for 1990 and 1992 frequency was around 20 times per year for phosphorus and nitrogen. BOD has not been measured. Total solids is an addition of total dissolved solids (TDS) and total suspended sediment (TSS). A summary of the USGS data from 1990 - 1998 which can be used in the PI is as follows:

DO	mean = 10.5 mg/L	range = 7.7 - 13.4 mg/L	n = 30
pH	mean = 7.6	range = 6.8 - 8.8	n = 30
total solids	mean = 58 mg/L	range = 20 - 178 mg/L	n = 24
fecal coliform	mean = 36 FC/100 ml	range = 2 - 120 FC/100 m	n = 30
total phosphorus	mean = 0.012 mg/L	range = 0.004 - 0.052 mg/L	n = 62
NO_2+NO_3+ammonia	mean = 0.044 mg/L	range = <0.005 - 0.136 mg/L	n = 62

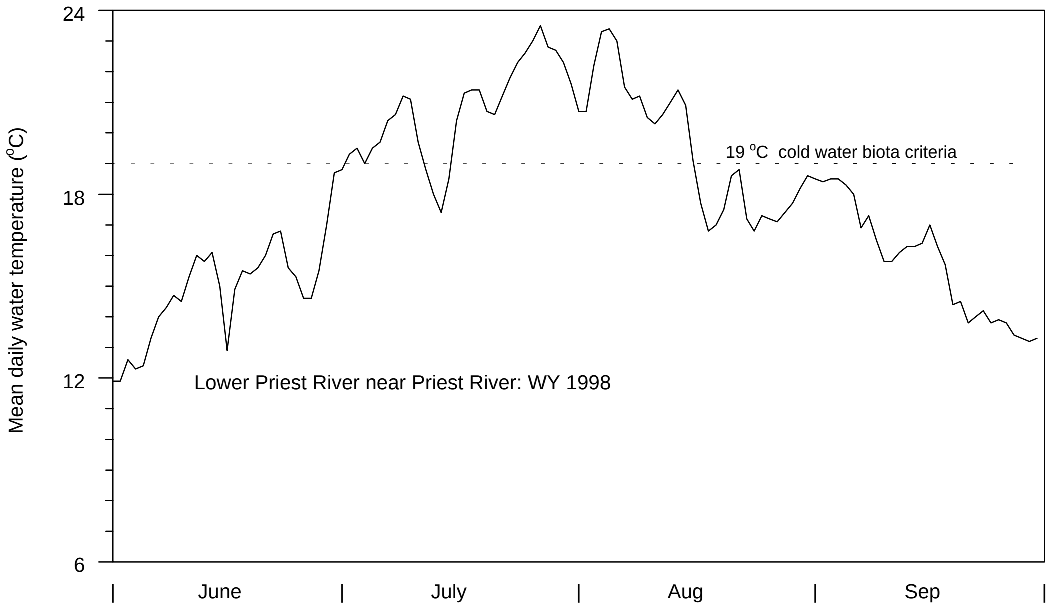


Figure 3-19. Mean daily water temperature of Lower Priest River measured at USGS gauging station, 3.8 river miles from the mouth, June - September 1998 (from Brennan *et al* 1999).

In 1998 USGS installed a temperature recording data logger for the months of June - September. Mean daily temperature is plotted in Figure 3-19. Daily average exceeded the Standards cold water biota criteria of 19°C by early July and remained above the criteria until August 17. Highest daily mean was in early August at 23.4°C, with the highest instantaneous temperature at 25.3°C. In earlier years USGS reports a maximum instantaneous temperature of 29°C. In summer months Lower Priest River begins as cool water, not cold water, as its source is the epilimnetic waters of Priest Lake. Upper layer waters of southern Priest Lake measured in July and August of 1998 ranged from 20 – 25°C.

See Summary of Basin Water Quality, Section 2.2.3.2 (page 36) for further discussion of measured parameters on Lower Priest River including estimates of the water quality from the lower basin stream composite draining into the river.

The 1998 BURP site (Figure 3-18a), a 620 m reach, was below the inflow of Upper West Branch, East River, and Big Creek, and above the inflow of Quartz Creek, Blue Creek, and Lower West Branch. The BURP site was above the main hay cropping and grazing region along the river course itself (Figure 3-18b).

Composite samples of periphyton from the BURP site were collected on four occasions as part of a state-wide sampling effort to develop a River Diatom Index (RDI). Periphyton samples were collected in September 1998 as part of the BURP assessment, collected twice on the same day in September 1999, and sampled again in October 1999. A host of diatom metrics from the state-wide samples were tested statistically for metric response against human disturbance categories, macroinvertebrate EPT taxa richness, and various chemical and physical water column parameters (Fore 2000).

A final set of 10 periphyton metrics were selected as RDI response indicators to degree of human disturbance. These included percent siltation sensitive diatoms, percent siltation tolerant diatoms, percent motile diatoms (siltation tolerant), eutrophic species richness, and percent adnate diatoms (attachment to rocks apically). For periphyton data of Idaho Northern Mountain sites with no history of silver mining, six diatom metrics were significantly different at sites with moderate to heavy human disturbance upstream of the site compared to sites with minimal to moderate human disturbance upstream. The Priest River data was placed in the latter, or undisturbed category on a relative basis state-wide. The degree of statistical discrimination of diatom metrics versus human disturbance was less for Northern Mountain data compared to southern and eastern Idaho data likely because human disturbance is less intense in the northern region (Fore 2000).

The mean RDI of the four composite Priest River samples was RDI = 38 (28, 40, 42, 42). The preliminary indication from ranking RDI scores is that the Priest River data falls within the range of "good" biological condition (Fore 2000).

One composite sample for macroinvertebrate data has been taken at the BURP site. Preliminary analysis of the data shows: good taxa richness (40 total taxa) and EPT richness (22 EPT taxa); good community balance in the way of low dominance by the numerically dominant taxa; a presence of elmid beetles (4% elmidae); and an upper score for percent predators (7%). Once developed, it appears that the River Macroinvertebrate Index score from this data will indicate a good, clean water community.

The 1998 USGS electro-fishing effort netted 138 total fish (Brennan *et al.* 2000). Fish in number per square area was not reported. Largescale sucker and northern pikeminnow each comprised around 30% of the sample. Percent composition for mountain whitefish was 15%, and 12% of the sample was redside shiner.

Measurements and results of habitat parameters within the 620 m BURP reach include: good bank stability and cover with little evidence of erosion; a channel distribution of 93% run and 7% riffle; and 7% fines in riffle habitat.

3.4.D.7 Status of Beneficial Uses

USGS data show that there are not exceedances of the cold water biota criteria for pH and DO at the lower river site. Water temperatures exceeded the Standards cold water biota criteria on most days from early July to mid August 1998. The aquatic life beneficial use cannot be judged at this time using the Idaho Rivers Ecological Assessment Framework. Salmonid spawning beneficial use is Full Support with mountain whitefish as the spawning species. This is based on IDFG assumptions and supported by USGS electro-fishing. Fecal coliform bacteria data collected at the USGS station shows that primary contact recreation is Full Support. Domestic water supply use of Lower Priest River is isolated to single family residences, so the turbidity criteria does not apply. The toxic substance criteria was Not Assessed.

3.4.D.8 Data Gaps

A comprehensive fish survey by IDFG within the river is needed for use with the River Fish Index as part of the large river bioassessment process to assess aquatic life beneficial use. In addition, a single BURP site is insufficient to properly assess a water body segment 35 miles in length. An additional BURP site should be established and evaluated further downstream, below the inflow of Lower West Branch and Quartz Creek.

Section 3.5. Summary Evaluations of Non §03(d) Listed 5th Order HUCs

Almost all major 5th order HUCs in the Priest River basin which are not §303(d) listed have had BURP assessment sites, and also were included in the 1992 DEQ Use Attainable (UA) survey. Many of these watersheds have had quantitative fish sampling by DEQ - BURP crews, IDFG or USFS. A few of the non-listed watersheds have had IDL - CWE assessments, and all of the western watersheds have various surveys conducted by the USFS.

Below is an information summary of eleven 5th order watersheds. Refer to Figure 2-2 (page 9) for location of the watersheds, Table 2-10 (page 40) for a summary of macroinvertebrate and fish sampling results, and Table 2-11 for habitat measurements. Like these tables, the watershed summaries are ordered geographically by northern streams draining into Upper Priest Lake, eastern streams draining into Priest Lake or Lower Priest River, and western streams.

3.5.A Northern Streams

3.5.A.1 Hughes Fork

Hughes Fork is a 4th order stream that flows into Upper Priest River about 0.5 miles north of Upper Priest Lake. Watershed size is 38,647 acres, main stem length is 14 miles, and there are approximately 67 miles of perennial streams. About 7 miles from the Hughes Fork mouth, the stream flows through Hughes Meadows, a large wetland - wet meadows complex. The USFS considers the watershed above Hughes Meadows as a "reference watershed". The main stem is mostly gradual gradient for the first one-half of its length, and the stream is considered to have abundant spawning habitat (Bjornn 1957). The watershed is considered of high importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

The entire watershed is National Forest land, and the western mountain range is part of the Salmo-Priest Wilderness SMA. Land use is primarily timber harvesting, and the USFS reports moderate land use disturbance with 18% of the watershed logged, a total road density of 3.1 mi/mi^2, a stream crossing frequency of 0.6 crossings/mile of stream, and a riparian road density of 2.5 mi/mi^2 riparian area (Table 2-13, USFS 2000a). These statistics are below the basin-wide averages.

Based on a USFS gauging station on Upper Priest River, the estimated WY 95 mean daily spring high flow for lower Hughes Fork ranged from 400 - 650 cfs, and summer base flow is 40 - 90 cfs.

There were two BURP sites on Hughes Fork, both below Hughes Meadows. MBIs were good at 4.9 and 4.1. Electro-fishing in 1998 by IDFG showed decent cutthroat density and occasional presence of bull trout (Table 2-10). BURP habitat measurements showed a mediocre condition with HIs of 82 and 89. Below mid-point scores included percent fines, embeddedness, and at one site an absence of pools. The DEQ UA assessment at three sites (all below Hughes Meadows) also showed mediocre conditions with one habitat rating of "good" and two ratings of "poor". One of the poor ratings was related to beaver activity, but the other site was labeled as a very silty reach with high percent fines. Overall, pool complexity and Residual Pool Volume (RPV) were above average.

There were also two BURP sites on Gold Creek, a major tributary to Hughes Fork. MBIs were good at 4.7 and 5.1, and on a basin-wide relative basis the HIs were good at 112 and 113. BURP electro-fishing showed cutthroat trout with three age classes, and presence of bull trout. DEQ placed a temperature sensor in Gold Creek from August 8 - September 30, 1997. The maximum mean daily temperature was 12.2°C and maximum hourly 14.1°C. On most days the EPA bull trout criteria was exceeded.

3.5.A.2 Upper Priest River

Upper Priest River is a 4th order stream that flows into the northern end of Upper Priest Lake. Watershed size is 50,984 acres, main stem length is 25 miles, and there are approximately 98 miles of perennial streams. The headwaters originate from the Nelson Mountain Range of British Columbia with 15,354 acres of the drainage in Canada. The main stem for its lower-most 2 miles is a meandering gradual gradient stream flowing through a broad floodplain. Beyond the floodplain to the Canadian border the stream flows through a steep sided canyon. At stream mile 16 there is a major fish migration barrier, Upper Priest Falls. The watershed is considered of high importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

The entire U.S. watershed is National Forest land. The delta from the confluence with Hughes Fork to the mouth, with wetlands and oxbows, is part of the Upper Priest Lake Scenic Area. Land use disturbance has been low, and the USFS reports (not including Canada), 5% of the watershed logged, a total road density of 1.2 mi/mi^2, a stream crossing frequency of 0.6 crossings/mile of stream, and a riparian road density of 1.4 mi/mi^2 riparian area (USFS 2000a). These statistics are well below the basin-wide averages. The USFS considers the watershed and stream system as a Properly Functioning Condition, and DEQ considers portions of the stream as "reference".

A USFS stream gauging station exits on Upper Priest River above the confluence of Hughes Fork. For WY 95 mean daily spring flow averaged 460 cfs with a peak of 925 cfs. Summer base flow is high, ranging 50 - 100 cfs. At the mouth, below the confluence of Hughes Fork, the estimated WY 95 annual volume of water delivered to Upper Priest Lake from the river was a substantial 255,417 ac-ft.

There were two BURP sites on Upper Priest River, mid-lower and middle reaches, and MBIs were good at 4.8 and 4.6. In 1998 there was extensive electro-fishing by IDFG and USFS within the main stem and several tributaries below Upper Priest Falls (Table 2-10). Cutthroat densities varied widely from poor to excellent; bull trout are present but mostly at low densities; and brook trout densities range from absent to extremely abundant.

BURP habitat scores were mediocre with HIs of 85 and 78, but that might be expected in a large and wide wadable stream (10 - 12 m base flow wetted width in the mid-lower section). Below mid-point habitat scores included high percent fines and embeddedness at the middle reach, and poor slow/fast ratios at both sites. The DEQ UA assessment at four sites, from lower to middle reaches, rated habitat at 3 sites as "good" and 1 site as "excellent". Overall, pool frequency was low but pool complexity and RPV were well above average.

3.5.B Eastern Streams

3.5.B.1 Caribou Creek

Caribou Creek is a 3rd order stream that flows into The Thorofare, a 2.7 mile channel that carries Upper Priest Lake outflow and Caribou Creek inflow into the northwestern tip of Priest Lake. Watershed size is 20,830 acres, main stem length is 11.5 miles, and there are approximately 37 miles of perennial streams. For the lower 5.5 miles of Caribou Creek the main stem is mostly low to moderate gradient, less than 1.7%. The stream gradient then steepens within the Selkirk mountains. Bull trout were historically present, and currently there is suspected spawning and rearing. The watershed is considered of high importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

The majority of the watershed is State Endowment Trust land, with a few blocks owned by timber industry and minor acreage of National Forest land in the northeastern mountain range. A portion of the northeastern range is part of the Selkirk Crest SMA. Land use is primarily timber harvest and disturbance has been low - moderate with an estimated 23% of the watershed logged, a total road density of 2.1 mi/mi^2, and a riparian road density of 0.5 mi/mi^2 riparian area (Panhandle Basin Bull Trout TAT 1998a).

Stream flow for WY 95 was estimated from a gauging station established on Lion Creek, the adjacent watershed to the south. Estimated mean daily spring high flow ranged between 400 - 600 cfs, and summer base flow between 20 - 50 cfs.

There were two BURP sites on Caribou Creek, mid-lower and middle reaches, and MBIs were good at 4.4 and 5.3. Electro-fishing by IDFG in 1998 was conducted within three upper reaches. Results were very poor with no cutthroat or bull trout sampled and only two brook trout captured (Horner *et al*. 1999). DEQ electro-fished BURP sites in 2000, and results at the lower site were poor with brook trout the only salmonid captured at a low density of 0.3 fish/m^2. Sampling at the BURP middle site had slightly better brook trout density, but again no cutthroat. Cutthroat trout were sampled in a 1982 IDFG survey, and bull trout have been observed in the past. In a 1956 survey, salmonids were also very scarce (Bjornn 1957), and Bjornn reported that local residents had recalled a good size run of cutthroat trout in the past (pre-1950s). Based on the IDFG and DEQ electro-fishing results, Caribou Creek will be more thoroughly evaluated as DEQ prepares for the 2002 §303(d) List.

BURP habitat scores were HI = 88 at the mid-lower site and a good HI = 108 at the middle site. Both sites had poor slow/fast and width/depth ratios. The DEQ UA assessments were at four sites within middle to upper reaches. Three sites had habitat ratings of "good", one site as "fair". Overall, pool complexity was only fair, pool frequency below the basin-wide average, and RPV was below average at three sites but at one site RPV was one of the highest recorded.

3.5.B.2 Lion Creek

Lion Creek is a 3rd order stream that flows west into the northeastern tip of Priest Lake. Watershed size is 18,440 acres, main stem length is 11 miles, and there are approximately 34 miles of perennial streams. The lower one-half mile of Lion Creek cascades into the lake with falls and rapids, and there are numerous log jams (Bjornn 1957). This reach flows through Lion Head State Park. The next 3 - 4 miles is B channel with 1.5 - 3.5% gradient, and then the stream gradient steepens within the Selkirk mountains. Bull trout are present with spawning and early rearing. The watershed is considered of high importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a). In a 1956 survey, the B channel lower reach above the lower-most falls and rapids, was considered to have good spawning beds and abundant cutthroat (Bjornn 1957).

The majority of the watershed is State Endowment Trust land, with a single one-quarter section block owned by timber industry, and some acreage of National Forest land in the eastern mountain range. A large section of the eastern range, 7,284 acres, is part of the Selkirk Crest SMA. Land use is primarily timber harvest and disturbance has been moderate with an estimated 35% of the watershed logged, a low road density of 1.6 mi/mi^2, but a substantial riparian road density of 6.1 mi/mi^2 riparian area (Panhandle Basin Bull Trout TAT 1998a). The high estimate of riparian road density relates to State Roads 41 and 42 which closely parallel Lion Creek on both sides for about the first half of its length, and State Road 41 which parallels a portion of South Fork Lion Creek.

An IDL - CWE assessment was conducted within Lion Creek watershed in 1999. The Canopy Removal Index was rated at 0.22, the Channel Stability Index = 54 (moderate), and the resulting Hydrologic Risk Rating was at the high end of "low". The road sediment delivery rating was "low", but only a small section of State Roads 41 and 42 along the main stem were assessed.

A stream gauging and water quality sampling station was established on lower Lion Creek as part of the Priest Lake baseline study (Rothrock and Mosier 1997). For WY 95 mean daily spring flow averaged 220 cfs with a peak of 550 cfs, and summer base flow ranged 20 - 50 cfs. Annual volume of water delivered to the lake was 65,870 ac-ft.

There were two BURP sites on Lion Creek, lower and lower-middle reaches. MBIs were good at 5.2 and 4.9. Between 1983 and 1994 there were four fish sampling surveys by IDFG (IWRB 1995). Averaged over the four sampling years cutthroat trout density was good at 8.6 fish/100 m^2, bull trout were present but at very low density, and no brook trout were observed (Table 2-10). DEQ electro-fished the BURP sites in 2000, and at the lower site cutthroat and brook trout were captured, both at low densities. At the lower-middle site cutthroat was sampled at low density. IDL electro-fished a middle Lion Creek reach in 1997 and no fish were captured. Based on the most current fish sampling efforts by IDL and DEQ that resulted in very low numbers of salmonids captured, further fish population surveys are needed in Lion Creek.

BURP habitat scores were decent with HI = 93 at the lower site and HI = 107 at the lower-middle site. Both sites had poor slow/fast ratios and the middle site had a high width/depth ratio. The DEQ UA assessments were at lower, middle and upper sites. The middle site was not rated. This reach was entirely a series of descending cascades and runs with small “pool” pockets. Habitat rating at the lower site was “fair”, and at the upper site “excellent” where pool frequency and RPV were well above basin-wide averages.

DEQ placed a temperature sensor in lower Lion Creek from August 8 - September 30, 1997. The maximum mean daily temperature was 14.1°C and maximum hourly 15.6°C. On most days the EPA bull trout criterion was exceeded.

3.5.B.3 Indian Creek

Indian Creek is a 3rd order stream that flows west into Priest Lake. Watershed size is 14,978 acres, main stem length is 10 miles, and there are approximately 25 miles of perennial streams. The lower 1.5 miles of Indian Creek is gradual gradient as it flows through Indian Creek State Park, and the remaining length is steep gradient B and A channel within the Selkirk mountains. Bull trout are present with spawning and early rearing. The watershed is considered of high importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a). In a 1956 survey the lower reaches were considered to have adequate spawning beds and abundant cutthroat (Bjornn 1957).

The majority of the watershed is State Endowment Trust land with some acreage of National Forest land in the eastern mountain range. A large section of the eastern range, 5,160 acres, is part of the Selkirk Crest SMA. Land use is primarily timber harvest and disturbance has been moderate with an estimated 36% of the watershed logged, a low road density of 1.9 mi/mi^2, but an above average riparian road density of 4.3 mi/mi^2 riparian area (Panhandle Basin Bull Trout TAT 1998a). State Road 2/27 closely parallels Indian Creek and North Fork Indian Creek for a substantial portion of stream length.

An IDL - CWE assessment was conducted within Indian Creek watershed in 1999. The Canopy Removal Index was rated at 0.10, the Channel Stability Index = 51 (moderate), and the resulting Hydrologic Risk Rating was “low”. A substantial 23 miles of road were inventoried, including long stretches of road parallel to the main stem, North Fork, and South Fork. The overall average road sediment score was “moderate”, one of the few watersheds assessed that had a score above “low”, but the total sediment delivery rating was low (roads + skid trails + mass failure scores).

A stream gauging and water quality sampling station was established on lower Indian Creek as part of the Priest Lake baseline study. For WY 95 mean daily spring flow averaged 150 cfs with a peak of 360 cfs, and summer base flow ranged 10 - 30 cfs. Annual volume of water delivered to the lake was 42,620 ac-ft.

There was a single BURP site on Indian Creek, a middle reach just below the confluence of the North and South Forks. The MBI was good at 4.9. Between 1983 and 1994 there were five fish sampling surveys by IDFG (IWRB 1995). Averaged over the five sampling years: cutthroat trout density was good at 13.4 fish/100 m^2; bull trout were present with generally low density, but the 1987 density was decent at 4.9 fish/100 m^2; and brook trout were present with low - moderate densities (Table 2-10). In 1994 there was BURP electro-fishing at two sites, with a mean cutthroat density of 7 fish/100 m^2 and multiple age classes, and very low brook trout density.

The BURP habitat score was good at HI = 107. The reach had poor slow/fast and width/depth ratios. The DEQ UA assessments were at two sites, a lower reach near the mouth and a reach on the North Fork. Habitat rating at both sites was "good". Both sites had above average pool frequency and RPV.

IDL placed a temperature sensor within the headwaters of North Fork Indian Creek from July 16 - September 22, 1999. This data shows that upper stream reaches can be cold enough to have only minor exceedances of various temperature criteria. The maximum mean daily temperature was 11.1°C (in late August) and maximum hourly 13.1°C. The Standards criteria for cutthroat spawning in July was never exceeded, and the EPA bull trout criteria was exceeded on only 24% of the days compared to nearly 100% on most lower reaches throughout the basin.

3.5.B.4 Hunt Creek

Hunt Creek is a 3rd order stream that flows west into Priest Lake. About 1.5 miles from the mouth the stream is bifurcated into a North and South Fork. The stream also bifurcates near the mouth. Watershed size is 11,906 acres, main stem plus North Fork length is 7 miles, South Fork length is 5.3 miles, and there are approximately 13 miles of perennial streams. The lower 1.5 miles is mostly moderate gradient B channel, and the Forks are steep gradient B and A channel within the Selkirk mountains. It is unknown if bull trout were historically present in Hunt Creek; they are suspected to be not present now. The watershed is considered of moderate importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a). In a 1956 survey, an impassable falls was identified one mile from the mouth and the stream was considered to only have resident cutthroat trout (Bjornn 1957).

The majority of the watershed is State Endowment Trust land with some acreage of National Forest land in the eastern mountain range. A section of the eastern range of the North Fork subwatershed is part of the Selkirk Crest SMA. Land use is primarily timber harvest and disturbance has been moderate with an estimated 53% of the watershed logged, a total road density of 2.5 mi/mi^2, and a high riparian road density of 8.9 mi/mi^2 riparian area (Panhandle Basin Bull Trout TAT 1998a). An IDL - CWE assessment has not been conducted.

A stream gauging and water quality sampling station was established on lower Hunt Creek as part of the Priest Lake baseline study. For WY 95 mean daily spring flow averaged 94 cfs with a peak of 220 cfs, and summer base flow ranged 20 - 40 cfs. Annual volume of water delivered to the lake was 32,585 ac-ft.

There was a lower BURP site, and a middle site on the North Fork. MBIs were good at 4.7 and 4.1. DEQ electro-fished the middle North Fork site in 2000, and cutthroat trout were captured at an adequate density of 5.3 fish/100 m^2. No other salmonids were sampled.

BURP habitat scores were HI = 89 at the lower site and a good HI = 108 at the North Fork site. The lower site had high embeddedness, a poor width/depth ratio, and no pools. The North Fork site had high embeddedness and a poor slow/fast ratio. The DEQ UA assessments were at two sites in the same vicinity as the BURP reaches. Both sites had habitat ratings of "good". Pool frequency and RPV were well below average at the lower site, and RPV was below average on the North Fork reach.

3.5.B.5 Soldier Creek

Soldier Creek is a 3rd order stream that flows west into the southeastern edge of Priest Lake. Watershed size is 15,815 acres, main stem length is 10 miles, and there are approximately 27 miles of perennial streams. The lower 3 miles is mostly gradual gradient E and C channel flowing through a large wetlands - wet meadows complex. The lower end of the tributary Lee Creek also flows through this floodplain area. Above the lower flat gradient, Soldier Creek quickly steepens to B and A channel within the Selkirk mountains. Bull trout are suspected to be present with spawning and early rearing, and the watershed is considered of moderate importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a). In the 1956 survey, Soldier Creek was considered as supporting a large population of brook trout in the lower reach, and moderate populations of bull trout and cutthroat in upper reaches (Bjornn 1957). At the time of the 1956 survey there were numerous log jams which may have impeded migration to middle and upper reach spawning beds.

The majority of the watershed is State Endowment Trust land with some acreage of National Forest land in the eastern mountain range. The lower meadows area is private ownership as well as the area surrounding the mouth. Land use is primarily timber harvest and disturbance has been moderate - high with an estimated 75% of the watershed logged, a total road density of 2.4 mi/mi^2, and a high riparian road density of 12.7 mi/mi^2 riparian area (Panhandle Basin Bull Trout TAT 1998a). A large area of the headwaters land was burnt in the 1967 Sundance fire (Figure 2- 6). An IDL - CWE assessment has not been conducted within the watershed.

A stream gauging and water quality sampling station was established on lower Soldier Creek as part of the Priest Lake baseline study. For WY 95 mean daily spring flow averaged 111 cfs with a peak of 246 cfs, and summer base flow ranged 10 - 20 cfs. Annual volume of water delivered to the lake was 34,400 ac-ft.

There were two BURP sites on Soldier Creek, lower and middle reaches. The lower reach was within the flat gradient meadows with a very sandy-silty substrate and few graveled riffles. The MBI = 3.3 at this lower site is below the Full Support score. The middle reach MBI was good at 4.8. There was BURP electro-fishing at the middle reach, with brook trout at a low density of 2 fish/100 m^2, no cutthroat or bull trout captured, and sculpin were present.

The BURP habitat score at the lower site was very poor at HI = 52, reflecting high percent fines and embeddedness, poor instream cover, and no pools. To a degree, this low habitat score may be reflecting deposition of sediment sources related to the extensive 1967 Sundance fire. At the middle site HI = 100, with poor slow/fast and width/depth ratios. The DEQ UA assessments were at three sites, all three within a 1 mile middle stretch above the meadows. All sites had habitat ratings of “excellent”. Overall, pool frequency and RPV were below average, but pool complexity and instream cover were rated high.

DEQ placed a temperature sensor in lower Soldier Creek from August 8 - September 30, 1997. The maximum mean daily temperature was 15.4°C, and maximum hourly 18.2°C. On all days the EPA bull trout criterion was exceeded.

Based on low salmonid density at a single DEQ electro-fishing site, an MBI and HI at the lower site which were below FS, and moderate – high land use statistics, Soldier Creek will be more thoroughly evaluated as DEQ prepares for the 2002 §303(d) List. Additional BURP electro-fishing will be scheduled for the summer of 2001.

3.5.B.6 Big Creek

Big Creek is a small 3rd order stream system south of East River, flowing west into Lower Priest River. Watershed size is 9,354 acres, main stem length is 3.6 miles, and then there is a bifurcation into a 4.4 mile North Fork, and a 4.9 mile southeastern Happy Fork. There are approximately 20 miles of perennial streams. The main stem is gradual to moderate gradient averaging 2.8% over its length, and then the two forks steepen within the southern most portion of the Selkirk mountains. The North Fork subwatershed reaches an elevation of 6,193 ft at Bald Mountain, but Happy Fork tops out at 4,257 ft. It is unknown if bull trout were historically present in Big Creek; they are suspected to be not present now. The watershed is considered of low importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

The majority of the watershed is State Endowment Trust land with some blocks of industrial timber land in the eastern mountain range. Land use is primarily timber harvest. Percentage of the watershed logged has not been determined, but estimates of the road system statistics are high with total road density at 7.1 mi/mi^2, a stream crossing frequency of 1.8 crossings/mile of stream, and a riparian road density of 6.6 mi/mi^2 riparian area (Panhandle Basin Bull Trout TAT 1998a). An IDL - CWE assessment has not been conducted within the watershed.

There has been no stream gauging efforts on Big Creek. One estimate of flow is a mean annual discharge of 35 cfs (Panhandle Basin Bull Trout TAT 1998a). Summer base flow at BURP sites has been around 8 cfs in the main stem.

There were two BURP sites on Big Creek, both on the main stem at a middle and upper reach. MBIs were both 3.9. IDFG conducted an electro-fishing survey in 1986 at 3 reaches in the main stem, 2 reaches in Happy Fork, and 1 reach in North Fork. Sampling results showed a good fishery throughout (Table 2-10), with good to excellent numbers of cutthroat, and an especially abundant population of brook trout in Happy Fork. BURP electro-fishing in 1997 within the main stem, using a 2 pass method, produced brook trout at 11 fish/100 m^2, cutthroat at 1.2 fish/100 m^2 with multiple age classes, and numerous sculpin.

The BURP habitat score at the middle site was HI = 92, with high percent fines (44%) and embeddedness, and a poor slow/fast ratio. At the upper main stem site the score was mediocre at HI = 75 with high percent fines and embeddedness, poor slow/fast and width/depth ratios, and poor lower bank stability. DEQ UA assessments were not conducted on Big Creek.

3.5.C Western Streams

3.5.C.1 Granite Creek

Granite Creek is a major 4th order stream that flows east into Priest Lake. Watershed size is 64,024 acres, the single largest 5th order subwatershed in the Priest River basin. Main stem length is 10.7 miles and mostly gradual sloped, and then there is bifurcation into two major 3rd order forks; the North Fork with a main stem length of 11.7 miles and the South Fork with a main stem length of 14 miles. The headwaters of the two forks originate in high mountainous areas from 5,700 - 6,500 ft elevation, with steep B and A channel type. There also are reaches of gradual gradient with wide floodplains and wet meadows, such as the large Sema meadows of the South Fork drainage. All together there are approximately 129 miles of perennial streams within the watershed. Bull trout are present in the stream system with suspected spawning and subadult and adult rearing, and the watershed is considered of high importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

In the 1956 fish survey, Granite Creek was considered the best Priest Lake tributary for adfluvial cutthroat trout spawning (Bjornn 1957). The main stem gradient is mostly low and free of serious obstacles for migration, and allowed for extensive gravel areas suitable for spawning. In the 1940s a fish trap for cutthroat spawners was in operation on the main stem. Numbers of cutthroat spawners had dramatically declined by the 1956 survey. North Fork Granite Creek was considered to have large areas of good spawning gravels, and the initial 2 miles of the South Fork was also considered as having good spawning habitat.

The watershed is primarily National Forest land. There are blocks of industrial timber land within the South Fork drainage, and there are private residential and timber lands adjacent to the lower main stem channel and surrounding the mouth at Priest Lake. Land use is mostly timber harvesting and the USFS reports low - moderate land use disturbance with 9% of the watershed logged, a total road density of 3.0 mi/mi^2, a stream crossing frequency of 0.6 crossings/mile of stream, and a riparian road density of 3.1 mi/mi^2 riparian area (USFS 2000a). These statistics are just below the basin-wide averages. There were extensive wildfires and multiple reburns over much of the Granite Creek drainage between 1890 and 1940 (Figure 2-6). USFS considers South Fork Granite Creek watershed as a "reference watershed". An IDL - CWE assessment has not been conducted within the watershed.

A stream gauging and water quality sampling station was established on lower Granite Creek as part of the Priest Lake baseline study. For WY 95 mean daily spring flow averaged 463 cfs with a peak of 970 cfs, and summer base flow ranged 55 - 125 cfs. Annual volume of water delivered to the lake was a substantial 148,170 ac-ft. Fecal coliform bacteria samples were taken and no value exceeded 10 FC/100 ml. Total suspended sediment concentrations during spring high flow was considered above the lake basin average, with a mean 4.5 mg/L TSS and a maximum 37 mg/L.

There were two BURP sites on main stem Granite Creek, one near the mouth and the other just below the confluence of the two forks. MBIs were good at 4.4 and 4.5. There were also two BURP sites on South Fork, a lower and upper reach. MBIs were 4.6 and 5.0.

Between 1983 - 1994 IDFG conducted four fish sampling surveys on the main stem and seven surveys on the South Fork (IWRB 1995). Averaged over the four sampling years on the main stem, cutthroat and brook trout density were low, and bull trout were present at a low density (Table 2-10). On the South Fork, cutthroat density averaged over seven years was somewhat better at 2 fish/100 m^2. Bull trout were present. In 1997 there was BURP electro-fishing at the upper main stem site. Cutthroat density was very low and no bull trout were captured (Table 2-10). BURP sampling on the South Fork produced a low cutthroat density and only one bull trout captured. The Kalispel Natural Resource Department conducted a snorkeling survey within six - 30 m reaches of the South Fork in 1997 (KNRD 1997). Mean cutthroat density was decent at 8 fish/100 m^2, but no bull trout were observed.

BURP habitat measurements on Granite Creek main stem resulted in mediocre scores with HIs of 85 and 88, but like Upper Priest River this is a very wide wadable stream. Below mid-point scores included percent fines (54% at the lower site), and very low slow/fast ratios. BURP habitat scores on the South Fork were HI = 94 at the lower site, and a basin high HI = 118 at the upper site. The DEQ UA assessment at three main stem sites of lower, middle and upper reaches rated habitat as "fair", "good", and "excellent" going upstream. Pool frequency and RPV were well below basin-wide averages at all sites.

The KNRD habitat assessment at 433 transects within 11 reaches on the South Fork produced an average habitat composition of 51% riffle, 30% run, 9% pool, 5% glide, and 5% pocket water (KNRD 1997). Average measured embeddedness was moderate at 38%, and stream banks were generally stable. The frequency of primary pools was 6.1/km. Occurrence of spawning gravels were common.

DEQ placed a temperature sensor in lower Granite Creek from August 8 - September 30, 1997. The highest mean daily temperature was 12.1°C and maximum hourly 13.8°C. On 70% of the days, the EPA bull trout criterion was exceeded.

3.5.C.2 Upper West Branch Priest River

Upper West Branch is a major 4th order stream that flows southeast into Lower Priest River. Watershed size is 44,623 acres, main stem length is 22.3 miles, and there are approximately 112 miles of perennial streams within the watershed. Goose Creek is a major tributary at the south end of the drainage, and main stem length of Goose Creek is 8.3 miles with a subwatershed size of 13,283 acres. The lower one-half of Upper West Branch is mainly gradual gradient channel through areas of floodplains, but there are some steep reaches near the mouth. The headwaters originate from steep mountains reaching 5,552 ft elevation at Hungry Mountain. Like other mid to lower west side streams, there are considerable main stem reaches with a stream bed substrate of thick sand. Most of Goose Creek is flat gradient flowing through a large wet meadows complex called Big Meadows which has been converted to hay cropping and grazing. The headwaters of Goose Creek is steep reaching nearly 6,000 ft at South Baldy Mountain.

Local ranchers state that bull trout were historically present in Upper West Branch and Goose Creek, but they are suspected to be not present now. The watershed is considered of low importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

The watershed is primarily National Forest land, and there is 1,627 acres of private land which is mostly labeled as an agriculture zone with hay cropping and grazing. Around 8,000 acres of federal land is designated as grazing allotment. USFS reports timber harvesting land use disturbance as moderate with 23% of the watershed logged, a total road density of 5.9 mi/mi^2, a stream crossing frequency of 1.0 crossings/mile of stream, and a riparian road density of 5.5 mi/mi^2 riparian area (USFS 2000a). These statistics are above the basin-wide averages. Overall, the USFS rates the watershed as 66% Not Properly Functioning, 18% Functioning at Risk, and 16% Properly Functioning (USFS 1999). USFS considers the roadless, upper-most headwaters above Colza Creek as a “reference watershed”. The upper one-half of the drainage burned over in wildfires between 1880 - 1890, and there were large fires between 1925 - 1939 in the headwater lands of Upper West Branch (Figure 2-6).

An IDL - CWE assessment was conducted within the watershed in 1999. A substantial 88 miles of road were inventoried, including long stretches of Forest Road 312 which parallels the main stem. The overall road rating and sediment delivery scores were “low”. There were 19 Significant Management Problems recorded associated with roads. Instream assessments of channel stability produced scores from moderate to high (trending toward unstable).

There has been no stream gauging efforts on Upper West Branch. One estimate of flow is a mean annual discharge of 158 cfs (USFS 2000a). Summer base flow at the lower BURP site was 35 cfs.

There were three BURP sites on Upper West Branch (1999); lower, middle and upper. MBIs were good at 4.3, 4.8, and 4.6 going upstream. IDFG conducted an electro-fishing survey in 1986 at 3 reaches within the main stem. Sampling results showed a low density of brook trout, no cutthroat trout, and a single rainbow trout captured (Table 2-10). BURP electro-fishing in 1999 at the lower site produced low brook trout density but with multiple age classes, and sculpin. Results at the middle site were low brook trout numbers, a single cutthroat captured, and sculpin. USFS reports electro-fishing at three reaches within the tributary Solo Creek, and results were low brook trout numbers and a cutthroat density of 1.6 fish/100 m^2 at one reach, but no cutthroats captured at the other 2 reaches.

BURP habitat scores at all three sites were good (on a basin-wide relative basis), with HIs of 101, 108, and 101 going from lower to upper sites. Percent fines were high at all 3 sites ranging from 41 - 87%. DEQ

UA assessments were conducted on three reaches. At the lower reach near the mouth the overall habitat rating was “excellent”. This was a mix of B and A channel type with very good pool complexity and pool frequency, and high RPV. The other two UA sites were within middle, gradual gradient reaches above the confluence of Goose Creek, and results conflict with BURP habitat scoring. At both UA sites the habitat rating was “poor”. This related to very sandy substrate, poor instream cover and pool complexity, and some stream banks damaged by cattle grazing and other riparian zone disturbances. Pool frequency and RPV however were good and well above the basin-wide averages.

No temperature sensors have been placed within Upper West Branch. In 1999 there were bacteria samples taken in the main stem and at the mouth of Goose Creek. Results which were presented in Section 2.2.3.2 (page 38) showed relative high values for fecal coliform and *E. coli*.

Based on low salmonid density from electro-fishing efforts, a high percent fines in stream channels, and bacteria results that were near or exceeded State standards, the Upper West Branch watershed will be more thoroughly evaluated as DEQ prepares for the 2002 §303(d) List. Goose Creek will be evaluated for 303(d) listing with bacteria as the pollutant of concern.

3.5.C.3 Quartz Creek

Quartz Creek is a 2nd order stream flowing southeast into Lower Priest River. Watershed size is 7,081 acres, main stem length is 6.3 miles, and there are approximately 18 miles of perennial streams within the watershed. The main stem is B channel for the lower-most 0.7 miles, and then for 4.5 miles the average gradient is <1.0%. The headwater lands are relative low elevation topping out around 3,100 ft. It is unknown if bull trout were historically present in Quartz Creek; they are suspected to be not present now. The watershed is considered of low importance in bull trout recovery plans (Panhandle Basin Bull Trout TAT 1998a).

The watershed is primarily National Forest land, and there are 1,334 acres of private land that is mostly labeled as an agriculture zone with hay cropping and grazing. There is one block of industrial timber land. USFS reports timber harvesting land use disturbance as moderate with 20% of the watershed logged, a total road density of 5.0 mi/mi^2, a stream crossing frequency of 1.3 crossings/mile of stream, and a riparian road density of 5.2 mi/mi^2 riparian area (USFS 2000a). These statistics are above the basin-wide averages. Overall, the USFS rates the watershed as Functioning at Risk (USFS 1999). Most of the Quartz Creek drainage experienced stand replacement fires between 1926 - 1931 (Figure 2-6).

An IDL - CWE assessment was conducted within the watershed in 1999. A total of 11.4 miles of road were inventoried, including most of Forest Road 416 which parallels the main stem. The overall road rating and sediment delivery scores were “low”. There were 5 Significant Management Problems recorded along Road 416. Instream assessments of channel stability produced an average score of moderate (trending toward unstable).

There has been no stream gauging efforts on Quartz Creek. One estimate of flow is a mean annual discharge of 23 cfs (USFS 2000a).

Two BURP sites were established in 2000, a lower and upper site. MBI and HI scores are not yet available from the BURP assessments. IDFG conducted an electro-fishing survey in 1987 at 3 reaches in the main stem (Table 2-10). Brook trout were very abundant, cutthroat were present at 1.5 fish/100 m^2, and brown trout were also sampled. DEQ electro-fishing at the lower BURP site resulted in moderate brook trout density and a few cutthroat captured. At the upper BURP site brook trout and cutthroat were sampled at low density, and sculpins were abundant.